

Computer & Video Games



SPACE

By Ray Darskan FOLLOWING the astonishing

snate of UFO sightings, the government has set up a special agency to investigate the possibility that an alien invasion is already taking place.

The new agency, which is to be stationed at a top secret base in Potters Bar, Hertfordshire, will he codenamed Space Watch and its charter is currently being drafted out by Whitehall.

Informed sources tell me among the special

Stop and search procedures on any craft suspected harbouring alien life. Close monitoring of unusually active radio wave-

bands with a special refer-

· Direct access to the radio telescope network and its which could indicate signs of intelligent life in the UK — Willesden has already come

And finally — and most controversially - the power to interrogate individuals who sight UFOs or claim any "close encounter They have already had 76year-old Gloucestershire Shane (whose now famous right) closeted away in Potters Bar for over six days. And we do know that a Sinclair Spectrum micro-

finds it difficult to admit the existence of agencies like Space Watch. Foreign Body Office

confessed as much yesterday. He denied that Space ernment thinking and said: make claims about a secret government agency and

Space Watch had already

"This is exactly the sort of mass hysteria I just de-And asked to comment on

confirmed that. "She is help-I asked Sir Geoffrey to eves on small green stalks. greatly exaggerated and anyway, the stalks were more the sort of mid-blue found in



Galaxian Colony By Our Science Correspondant

A COLONY of creatures have chosen to put forward

a report in the science jour-nal "Which Cosmos?" The author of the report. D'Ingham claims the aliens November and feels they may make their landing under cover of firework dis-He says that other scien- the

tists have come up with the Galaxians were on their way same evidence he has, but to Earth.

different theories to explain Says the professor: "Just because these aliens' spacecraft aren't as spectacular as

those created in the films Star science tends to laugh them off. But although their spaceship design is admitted-He first hit the headlines in '70s with claims that

a doctorate in Alien Fauna. life, has been written off by "A complete and utter crank". But his beliefs gained new credence this He has done most of work on an Apple Computer using AlienCale software in a study of TV crisp and instant

The professor, who claims

Hungarian Squares

Puzzle Ry Ivor Storey

In Budapest THE INCREDIBLE sequ-Eastern Bloc countries has seen credited to a "Bermuda Triangle" effect.

Over 27 dissident hikers

who have gone missing under the past six months are now believed to have entered areas where the Hungarian Squares phenomenon exists this was a me-or-it situaideals can pass through these together by a Texas Instru-

ments 99/4a microcomputer

NEWALIEN PANIC in wild strawberry patch dug into the ground where By Tom Sancukes

Country Staff WILTSHIRE market

gardener says he has killed an alien being in his wild strawberry patch.
Alfred Hickey made his claims to police after a strug-gle with the alien among his greenhouses and orchards

he had previously dug in an area of his allotments overrun by wild strawberries. He squishy head" with a shovel before burying it in the

Hickey claims to have finished off his adversary. they only found strawberry remains - these are cur rently being analysed by

Said Hickey: "I was out in the apple orchard inputting size readings onto my Atari microcomputer when this scarlet horror leapt at me from behind the compost

Grabbing the nearby shovel, I fought back chasing it into the greenhouse com-

"I got in a couple of good slugs by the growbags, although it tried to do a runner. I eventually forced it ato pots

"It's caused no end of damage. I only hope this sort Hickey showed our reporter where the struggle had taken place and it would

into this hole in the straw

seem to have been a particu-Tve already had some UFO protection league onto mysterious circumstances in me about preserving alien fauna," said an unrepentant Hickey. "But what these people don't realise is that

A police spokesman said: Thursday, it was a rabid gooseberry among his tom

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OCTOBER 1982 No. 12

News & Reviews

Meet the Winged Avenger and a giant Meet the Winged Avenger and a giant bee in intergalatic conflict. There's a desert mystery to be solved too.

VIDEO SCREENS Take Tron home for a replay of the movie's deadly games and listen

ARCADE ACTION More Tron action and tips on Tempest
— the game that almost never was.

REVIEWS An almost perfect game for the VIC-20
— that's Omega Race. Plus a friendly

NEXT MONTH 5



Look out! Here come the Kamikaze aliens, dropping from the Listings sky like little green hailstones. Catch them on page 44.

SPACE WATCH

Don't blast the aliens ... Try to discover the secret of befriending them. This game is the antithesis of Space Invaders but there is one danger, a foreign power is trying to make contact first. Runs on a

WORD SEARCH

You'll be lost for word once you've keyed-in this offering for the ZX81 MINING COLONY The space miners are cetting reetless. They've been without food for weeks and the robot stups carrying supplies have tall allow as assessed field. Can you prevent industrial action by guiding your Atom powered ships safely through the asteroids?

WILDSTRAWRERRIES Things are getting rough down on the allotment and the Strawber are revolting. The Atari gardener could find himself in a iam!

KAMIKAZE Watch out for falling aliens! Like little green hailstones they plu from space with only one thing on their mind - destruct

GALAXIAN COLONY II Those aliens are at it again! Invading earth, this time with the help of the Apple II. Can you save the world?

BRICK BLASTER If you don't feel like becoming another brick in the wall then get sting with your VIC-20.

More puzzling than the Cube, more colourful than a trip into hyper space. This one will give your Texas Instruments TV99 a real

It's all here: alien landers, radar screen, hyperspace, smart bombs and those stlly humanoids who insist on climbing mountains. Sharpen up your Defender tactics FOUR COLOURS

Can you bring some colour to the circuits of your BBC micro.



Advertisement manager Rra Lewis, Advertising executive Neil Wood Advertisement assistant Louise Flockhart, Publisher Tom Molorey Editorial and advertisement offices: Durrant House, 8 Herbal Hill, London ECIR SIR: Telephone Editorial 01-278 6886. Advertising 01-278 6882 COMPUTE AND VECCO GAMES FORTH. SERVERITHON SERVER. In most the parts found that districtions forces, report of COMPUTE AND VECCO CAMES on the similar for our distriction. He was all the serverity of the serveri

Cover: Design; Linda Freeman. Photograph; Industrial Art Studio

Watch this space

In September we proudly hoasted that this was going to be the issue which put a capital "G" in Computer & Video Games

An optimistic prophecy considering my ineptitude with a typewriter shift key, but there they are and we hope you like them.

Kate Clements' Watch gives a whole new look to Alien Invasion games and may revolutionise Mastermind-type code games too. But if making friends with the aliens smacks too much of pacifism then Kamikaze and Sharp Defender should make amends.

Brick Blaster gets this month's Government Health Warning: this game is addictive and may damage your keyboard's health.

Features MAILBAG

COMPETITION A whole batch of Tron goodies un for RIIGS

CHESS Max Bramer takes to the internat

PRESTEL 29
The gateways that could open up new routes to computer gaming ADVENTURE 68 GRAPHICS

All you need is a little maths PRACTICAL PROGRAM-MING Speeding things up with Ted Ball

RRIDGE Helping your computer into contract HARDCORE RN A look at the underestimated Texas Instruments T.I. 96/4a RRAINWARE 82 SOFTWARE GLOSSARY

KIT KORNER 84 Editor Terry Past Staff Writer Excess Lacov. Editorial assistant Sunn Cameron. Design Linds Freeman, Production editor Ten Metcalle

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HEXT

You only have to look at the cinema screens to realise that Fantasy rules OK. And in computer terms, this fas-

cination with things escapist surfaces in adventure games, role playing aids like computerised dungeons and computer moderated

gaming.

Next month, we give you some guidelines to setting up your own

fantasy world on computer. We are also taking a longer look at computerised puzzling with some for you to solve.

Among the games listings are:

Among the games issungs are: Four-a-Side Soccer, Uranium Ore, The Croydon Blag* and a lot more hesides

For those who aren't leen Sweeney and Minder fams a

GIANTS CLASH There is a storm brewing in the games software industry which

games software industry which could change the way you buy your discs and cassettes.

While C&VG does not usually involve itself in industry news or comment, this was one story we thought you should be told about.

The issue is software copyright and the adversaries preparing for legal battle are industry giants Atari and Commodore. The battleground for this test case is Pacman and the key question will be: Can you copyright an idea?

The background to this case involves Liverpool-based software house, Bug Byte who first brought Atar's software protection policy to everybody's notice when they felt forced to withdraw the Vic-20 cassette Vicmen which Atari had claimed was too similar to their licensed Pacman qame.

Bug Byte produced a press release which claimed they did not feel they were infringing copyright but did not have the resources to fight Atari and its massive parent, the Warner Brothers Corporation.

Commodore does have the resources and when Atari threatened to sue the large U.S. microcomputer company over its Vic-20 cartridge Jelly Monsters, the lawyers were called in.

There is no software copyright law in Britain at the moment although there is in the U.S. and both the computer industry and the Government feels that software



in Iransyvenia you cannot arways make it to the newsagenis on the right day. Last 18th of the month, I couldn't get out 'till late and my newsagent had put a cross on his door. Well there hadn't been any plagues around (I talk to rats, I know these things) so I guessed he must be keeping.

my copy of Computer & Video Games.

Sure enough when I flew in the window, I saw my copy all covered in garlic — and it had Haunted House in it too! That's what I get for playing with my VIC all night, instead of terrorising the

local peasants.

Anyway I had a little word just under my newsagent's ear and now we get on

fine.

Have a word with your newsagent —
fill in the form.

copyright is necessary and have set up committees to look into the best way to set out the laws. This test case may now save them the trouble.

The essence of Atari's case is that they hope to protect the innovative games designer and to ensure a higher quality of games software. Arguments — sorry discussions

 with writers from several software companies show that feelings run high on this subject and not all games writers want to be protected.
 Atari usually take the part of the

"Indians" in these discussions as a large corporation flexing its legal muscles.

Atari did not invent Pacman. The name Pac comes from the Japanese Pacu — meaning to eat — which shows its true origins. In the U.S. Pacman was the property of Bally Midway who produce the "official" arcade machines.

Atari bought the rights (licence) to put the Pacman name on the games cartridge for its TV games To my newsagent: Please deliver/
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centre console — a name you can copyright over here — so other companies played safe by using names like: Super Glooper, Snapper, Vicmen and Jelly Monsters. Atari boucht its way into that suc-

Atan bought its way into that success, others programmed their way into it. If Atari proves its case then games designers with innovative ideas will clean-up.

On the not so positive side, it may mean that some popular games may never find their way onto your type of home computer

My own feelings are that the software copyright tangle does need sorting out over here. And while Atari may be fighting the right battle to sort out that mess, they have chosen the wronch battleground.

The Atari VCS Pacman is a very different game from the one which everyone has been plagiarising.

As comment pieces go this is probably a little sit-on-the-fence-ish but I am reserving my opinions until Atari have had a chance to defend their decision to me.



EXCELLENT ENGINEER!

Dear sir,

I am the proud owner of an Atari 400 computer, and buy your magazine every month. The Engineer was the property of the state of the state

I would like to expand my 400 to 32K, and could I ask you which (if any) Ramcard ing soil of the county, could you tell so exceeding the county, could you tell so which programs you shall be publishing for Atari in forthcoming issues. Keep up the excellent magazine, and don't forget Atari.

David Mills
Rochdale

Editor's reply: Officially the machine was only intended to be expandable to 16K. However, Calisto Computers of 119 John Bright Street, Birmingham, B1 1BE produce and fit a board. For approximately £100 which will take your Atari 400 up to 32K.

FEATHERED FRIENDS

Dear Sir,
Just as I was beginning to
despair of finding a regular
microcomputer magazine
which properly

which propensy acknowledged the existence of the BBC micro, I wandered into our local newsagents and found your first issue of the OWL supplement. Of course I instantly pounced upon it and placed a permanent order for your magazine.

Having had my BBC Model A delivered only a few weeks ago and having had very little Basic experience before that, although we do

have an ancient Pet at the office, I regret that I cannot yet think in terms of making a contribution to OWL. In the meantime may I suggest that in the near future it would be useful to a lot of people if the tipster article could include some plain

suggest that in the near future it would be useful to a lot of people if the tipster article could include some plain language explanations of some of the more obscure keywords in BBC Basic and their equivalents in other Basic dialects.

For example I get the

For example I get the impression that one uses one of the VDU commands in BBC instead of PEEE and POKE and although I'm presently still researching I'm not quite sure of some of the relationships. Richard A Bates, Exmouth, Deserver, and the state of the command of the present of the present

A WIZARD Adventure

Dear Sir, Would you oblige us by pointing out to your readers an error in the article by Keith Campbell headed Rooms at the Top in the March 1982 edition of your

Wizard's Mountain was not written by Jeremy Zowold. It was written by rey colleagues Nick Spicer some two years ago for the Apple II when he was working for the Software House as a software consultant. The original wersion of the program which bug which Reith Campbell mentions in his review. Who would try and compute the



log of zero for a watch only somebody who was copying the program and did not understand even how the program was intended to function.

Having said all this we feel that Wizard's Mountain is now rather 'old hat' and feel that you may be interested in the hi-res 21 colour adventure for the Apple II which is currently under development. Dick Williams, South Croydon.

PRESTEL AND THE VIC

Surroy

Dear Str., My VIC-20 and I have been wery interested in your articles on Prestel. I already have a Beebox 40 Prestel graphics adaptor (e.g. 40 columns etc.) So what do I do now and how much will it cost?

Another thing which bothers me is, are the Telesoftware programs in Basic and if so what sort of Basic?

I don't see how a person with a Tandy using Prestel can use the same programs as a Commodore using a Prestel. Do you have to alter the programs for your machine?

Brett McBain, Wisborough Green, West Sussex. Editor's reply: You're at

least halfway there with the Beebox adaptor. Your next need is some Prestel software and a box that will allow you to connect to the telephone.

A number of people are working on systems to do just this.
You could try and see if one of the Tantel Prestel

adaptors can be connected to your system. The cost is about £150-£200. Telesoftware is machine specific — so you would only be able to download VIC software.

SOLUTIONS TO THE 7X . . .

In reply to D. McRiner of Shetland's letter, emphasising how, after a certain time, the unexpanded ZX81 will not EDIT. I find that if the line to be

EDITED is first LISTED, a following EDIT statement will carry out this function. For example if the line 570 is to be EDITED, key in LIST 570, after entering this enter EDIT and the command will be carried out.

Tim Hammonds, Barnsley,

South Yorkshire

THE WISE OLD OWL?

Thank you for the very fair and perceptive review you gave my book Let Your BBC Micro Teach You To Program in the Owl

Program in the Owl supplement in September. However, I would like to correct one slight inaccuracy. The price of the book is not

as printed in your review. It costs £6.45. Tim Hartnell, Earls Court Road, London.

WE SLIPPED A DISC!

Dear Sir,
I would like to point out a
simple mistake you made in
your September issue about
disc drives for the ZX81. You
proclaimed that there are no
disc drives available for the
ZX81 and none are likely to
be developed. But ...

Macronics is offering a drive and interface for the ZX81 for £160 which includes

expansion motherboards and 2K Ram. Kevan Thorn, Dean Street,

Blackpool.

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LIFE (machine code) A ZX81 version of the well known game.

30 TIC-TAC-TOE (Basic) Played on a 4×4×4 board, this is a game for the brain. It is very hard to beat the computer at it. 7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Stead-

Cassette 4 costs £5.

SPECTRUM SOFTWARE WANTED



MAILBAG

TRANSLATING SPECTRUM

Dear Sir,
Please could you tell me how
to translate the statement,
"ON x GOTO ..." into
Spectrum Basic?
Simon Proctor,
Newport,

Gwent.

Editor's reply: ON x GOTO

... can be replaced with the following, rather awkward expression when using the

expression when using spectrum.

IF x = 1 THEN GOTO a

IF x=1 THEN GOTO a IF x=2 THEN GOTO b IF x=n THEN GOTO ...

EINSTEIN A-GO-GO

I was intrigued by David Langford's article, entitled Einstein-a-Go-Go in the May edition, of your excellent magazine.

magazine. In fact it was so interesting, I felt compelled to write. There were two points not fully explored which I found mentally frustrating. So I was wondering if you could help out — without becoming too technical.

technical. Which cosmic law dictates that faster than light (FTL) travel is impossible. Surely anything which travelled FTL, in the universe would by its own speed, be invisible, and therefore very difficult to

At the (velocity of light) C, a spaceship's mass would reach infinity. This may be so, yet if a spaceship could break the 'light barrier', then would not all the laws be reversed at speeds in excess of C? Until finally, the spaceship became infinitely easy to propel. Also at such speeds what would the

human eye see — if anything? Would light rays emitted from objects behind the spaceship, not be able to reach it? Thus giving the impression of a void, behind.

impression of a voice, behalfur. Vision would be cut by 50 per cent, only being able to see objects in front of the spaceship. Also the objects off to the side, will they be seen where they are, where they have been, or where they are going to be? So foreseeing the future!

The article said that it would take 10,000 years to travel across the galaxy. This seems to indicate that there is an edge to the galaxy. If this is so, what is beyond that edge? Perhaps another galaxy. But surely even galaxies must end at some

galaxies must end at some discernible edge? What exists beyond that edge? People once believed the earth was flat, this of course was not true. What shape is the galaxy or galaxies, or is

earth was flat, this of course was not true. What shape is the galaxy or galaxies, or is man's brain not old enough to comprehend, only to question?

R. M. Cooper, Halifax, W. Yorkshire.

David Langford replies: To answer all the questions here would take a whole book! One such book is The Science in Science Fiction by Peter Nicholls, Brian Stableford and myself, to be published by Michael Joseph later this year. The Pelican Relativity for the Layman is also worth a

look. Einstein's well-tested Special Theory of Relativity predicts that we can never travel faster than light since our spaceship's mass would swell to infinity as we approached velocity c. We'd need infinite energy, infinite fuel, to accelerate to

c let alone faster. But there may possibly be particles called tachyons which naturally travel faster than light: the equations say the mass of a tachyon would be an imaginary numy, the mass of a tachyon would be an imaginary numy, the mass of a tachyon would be an integrated by the mass of a tachyon to let a tachyon to let a tachyon to less than c: the 'light barrier' is impassable to

from both sides.

Mathematicians have even worked out that from the viewpoint of a tachyon creature, it's we who would seem to be travelling faster than light — we would seem inaccessible beyond

the light barrier.

The general opinion is that something travelling FTL would exist (if at all) in a different "tachyon universe" beyond any hope of detection — both

detect us. This is just as well, since most of presentday physics would fall apart if it were possible to outrace light and effectively neep into the future!

peep into the future!
Finally, the cosmological
questions. Our galaxy is a
multiple spiral of stars
around 10,000 lightyears
across; light takes about
10,000 years to travel

across it and our slowerthan-light spaceship must always take a little longer.

There are very many more galaxies, out to as far as our telescopes can see. Now hold onto your hat: we believe there's a limit to the number of galaxies all right, but also that there's on edge. The General Theory of Relativity shows that space is curved

that space is curved through four dimensions in the way that the Earth's surface is curved through three. And, just as if you tried to reach the edge of the Earth, a long enough journey would take you right round the universe and back to where you started.

THE WONDER OF GRAPHICS

Dear Sir,
Now that I have discovered
your excellent magazine, I
have developed an even
greater interest in computers.
I do not yet own one of my
own, nor have I ever seen
any of the more sophisticated
games played on a home
computer. So being naturally
curious, I wonder if you

FTL would exist (if at all) in a different "tachyon universe" beyond any hope of detection — both invisible to us and unable to invisible to us and unable to

achieve the same degree of definition and speed of graphics on a home computer as on a good dedicated games machine such as the Atari, Philips or Intellivision?

I understand that the computer executes statements one at a time in numerical order (except for loops and jumps), so how is it possible to have dozens of objects all moving on the screen simultaneously, such as in Space Invaders or Galaxians?

Mr A A Birch,

Pearsth,

Editor's reply: Your home computer, with some decent software should be able to give you better definition and animation than a dedicated games machine. Most good games use machine code — which is about 10 times faster than proper than the speed of execution is fast enough to food the eye!

BASIC WORDS OF WISDOM

Dear Sir,
I've had your magazine on
order since the first issue,
and think it is the most useful
and interesting magazine out.

I'm writing to see if you can help me with the Peek and Poke locations on my computer. I have a TRS-80 Level II, and do not know many of the useful locations in the Basic Vectors on it.

I know about the keyboard scan locations, but can you recommend a book (other than TRS-80 Assembly Language Programming), which will have these

locations in?
I am also doing machine

language programming, so any of the Rom subroutines (such as the random number generator) locations would also be appreciated. Andrew Wright, Walsall, West Midlands.

Editor's reply: A good book to look out for is 'More TRS-80 Basic' by Inman, Zamora and Albrecht. But the book you quoted, 'TRS-80 Assembly Language' by Howe is still the best introductory publication.

COMPETITION COMPETITION COMPET

WORD OF THE KSIFFCHI

alcohol. In other words, they are typical merchants

This description comes courtesy of Marcus Rowland, the Ksiffchi's human mentor, who is currently guiding them through C&VG's Starweb game.

By now, the game should have progressed sufficiently for these early comments on Ksiffchi tactics not to affect their aim to become the dominant force in the known galaxy

Harken then to the words of the Ksiffchi as translated by Marcus .

three other empires, and one

I hope my moves this turn will



The solution to September's Nevera Crossword is printed above. But our September Mind Routines was more tricky than usual. The figure in the "H" "N" box should have been a "4" and not a "2". So we have extended the deadline by two further weeks on this. Entries by 1 October please. More Brainware on page 82.

Winner of our August Mind Routines problem was Mr S. Templer, of Haves, Middlesex. The crossword winner was Mr A. Doherty, of South Ascot. Berkshire.

Our hoped-for Tron competition has had to be put back an issue because of space pressures — the publishing kind, that is.

But we hope to bring it to you next issue. November also sees the introduction of a competition so different that it is going to take us three issues to get it going.

our attention. Portsmouth-based Automata is producing its own version of the successful "Mas-querade" puzzle. Pimania is the name of this adventure type game and Automata is putting up a prize valued at £6,000 for the first person to solve it. More details next month. For the last word on competitions this issue, don't forget to let us know the best game we have published for your computer, since we launched. Your votes could influence the Games Designer of the Year competition we have been running over the first 12 issues. A trip to Paris is



Perhaps you heard the editor grovelling on the phone this

"No I'm terribly sorry, it's a complete mystery to us ... we had it working in the office just before we listed it ... I think someone must have sat on the keyboard.

YUK! Pathetic creature. Anyway the truth is that Mini Defender was a Screaming Foul-up special. We don't let him out much these days. But when we do . . .!

The offending lines are as follows:

40 LET B\$(E) =C\$ 70 FOR E = 9 TO 2 STEP -C 200 NEXT B

One line which wasn't even graced with a line number was 80 which got mixed up with line 70. It starts at: PRINT AT D.D: and continues until the end of that line.

Martian Explorer (August) had more of T. Hitch's subtlety about it: line 4115 is a clear screen command and lines 4130 and 4140 contain a no. of graphics characters in inverted commas. Type in the following with the CTRL key depressed. 4130 ? "FUEL (8 spaces) 0 ZRXRXRXRXRXRXRXRXRXRX 100° 4140 ? "SPEED -60 ARSRSRSRSRSR SRS RSRSRSRSR A 60" The central SRS should be

printed in inverse video Several enquiries about Bomber

last issue but we never touched it. If in difficulties check your "I"s and "1"s.

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COMPUTER & VIDEO GAMES 13

INNOVATIVE TRS 80-GENIE SOFTWARE rom the professionals



Fantastic new flying simulation

Occasionally a program comes along of such magnitude that it is hard to describe it, especially within the space allowable in an advertisement. Jumbo is such a program. There have, of course, been trying simulation programs before, but they have all rather falled into the trag of trying to produce or graphic representation of the ground at some stage or other in the program, thus taking up space, and or

New York.

The program was written by two authors who combined their prior shalls to produce a unique prior of software. The programme got the last by the prior of the prior of the last by the last by the last by the prior of the last by the l

go and taken forward of their content case.

A float is applied containing various feets of data which you set head, valuating the take off calls for a FAT with various base off.

A float is applied containing various feets of data which you set head, valuating the take off calls for a FAT with softward base off.

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display. Bearing and distance to your intended point of landing are available all the time. The instruments, incidentally, consist of.
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AMFRICANS SEND IN THE **ALIENS**

ZENITH

A dual sensation of flight and speed are the two key attractions in a new 3-D space game from America called Zenith Your mission: defend the new

space city which is being constructed to house the inhabitants of the old galaxy. The aliens are attacking. Spiralling towards you in colourful geometric shapes.

You wrestle with the joystick in an attempt to keep your ship steady, and get the aliens in your gunsights - as the chequered ground sways to and fro zooming past beneath you.

Zenith is one of a new series of games for the Apple II from house Gebbelli. The game is sold

DEATH LURKS BENEATH THE WAVES **BBC POLARIS**

do not sink the enemy fleet that game runs on the BBC model B is advancing on your submarine and costs £8.00 from Bug Byte. at a rate of several knots.

"Up periscope" you scream at a trembling crewman, survey the horizon to spot two carriers complete with jets, depth charges, and anti-submarine helicopters.

The enemy ship is in range of your heat seeking missiles. You must give the command. It's kill or be killed. But can you do it?

All those hours spent at the simulator at naval school flash through your mind. You must have downed dozens of ships there every afternoon. But then that was just a game - this is the real thing. You pull yourself together and blurt out the vital command "fire"

BBC Polaris simulates the action of a sea battle with you as the captain of a Polaris submarine. The game runs on the model B, and costs £8.00 from Liverpool based Bug Byte. Space Pirates is an Asteroids

in this country by S.B.D. of Richmond at £21.50, together with the two other snace names - Lazer Silk at £18.00 and Phaser Fire at

Also new from S.B.D. this month is an insect war game called Fly Wars.

You are a spider crawling around the screen weaving a web, when suddenly you are attacked by a variety of pests. Fly Fighters can be easily trapped in

> Fly Wars runs on an Apple II in 48K and is available from S.B.D.

Budding chess supremos will

£11.50 from the Liverpool firm

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Atlantic flight from Heathrow to Kennedy airport in New York without leaving your front room This flight simulation game is based as closely as possible on the actual controls of a Jumbo jet. You have a choice of six

Molimerx say they are selling more copies of this game than of any other game they have ever The game runs on a TRS-80 or

the States

destinations in the UK and six in

a Genie 1 or 3 and it costs £15 plus VAT from the Bexhill-on-Sea based firm.

Also new from Molimers this month is an underwater sea hattle game in which you cantain a submarine and attempt to sink the enemy fleet which is bombarding you with depth charges from the ocean surface.

Seawolf runs on a TRS-80 or Genie 1 and 3 at £8.75 plus VAT War gamers will welcome a return to the eleventh century in a battle between the Saracens from Molimerx at £11 75 plus VAT and runs on a TRS-80 or Genie 1



BANDIT INTO YOUR HOME velcome this latest addition to

CASINO the Bug Byte range of games for

the BBC computer. The game Tired of walking to work when features a high resolution display of the board in full colour. It has you have put your last 20p in the

fruit machine down at your local? a quick response on the lower skill levels enables you to set up Here is a way to kick the habit gradually with a fun version of chess problems and retain games on tape. Chess costs the seaside pier favourite which offers you all the excitement of the real thing, but is a lot easier on your pocket - and your feet.

The game produces the three wheels on your screen which spin when you tap the appropriate key. The wheels stop one after the other and feature all the fruits, bells, and crowns of a normal one armed bandit. Card sharks will also enjoy the

pontoon game which is featured on the B side of this cassette. Casino runs on a ZX81 and is available at £2.50 from A. Stoke, Harrogate, Yorkshire.

NASTY KIND METEOR STORM There are close encounters of

ENCOUNTERS

OF THE

the dangerous kind in this latest game for Sinclair's new baby. Two different types of flying saucer and a bombardment of meteors are featured in the latest Asteroids type game for the

The game features thrust, fire, and hyperspace - moving left right on the keyboard thus recreating the principle features of the arcade version.

You also get a personalised score read out at the end of the game and a hold facility.

This enables you to make a cup of tea or answer the door. and then take up the game where you left off when you are ready to take on the aliens again. The game also talks to you utilising the standard sound capabilities of the machine.

Meteor Storm is the latest game from Southampton based Quicksilva in the race to produce games for the Sinclair Spectrum. The game can be purchased from Quicksilva at £5.95 inclu-

NEW PRODUCTS NEW PRODUCTS NEW PRODUCTS NEV

JUST WHEN **YOU THOUGHT** IT WAS SAFE!

BBC INVADERS

Having colonised just about every microcomputer on the market those power mad Space Invaders are on the offensive again - this time gunning for the

BRC model R These Invaders have learnt a thing or two from previous camnaions - namely the ability to fire missiles diagonally, as well as vertically. They can also move at six different speeds, and fire missiles at three different speeds, depending on the skill level you select.

will enjoy the fleet advancement feature on this game which cause the fleet to jump down the screen each time you go onto a

The game gives you a comprehensive score and performance read out at the end of each game. You are told how many shins you hit, and their types. The number of shots fired, and your

percentage success. BBC Space Invaders is avail-

THE LIGHT FANTASTIC

LIGHT PEN

Light pen games are become increasingly popular especially with younger users. An electronic pen enables you to locate and then move characters on the screen - for example chess pieces or the counters in the game Go.

A light pen for the VIC-20 is manufactured by Stack Computers of Merseyside. It costs £25.95 plus VAT and comes complete with an instruction manual and a free copy of the card guessing game Concentration

Other games from Stack to be used with the light pen are Back-Solitaire. gammon. Life, Draughts, Othello, Go and Ludo. These family favourites all come on cassette for the VIC-20 and cost £5.00 each.

able from Leeds based Program

Power at £6.95 plus VAT. Also new from Program Pow this month is Astro Navigator, a game in which you must navigate your space ship through a series of undulating caverns full of giant mice whose main aim in life is to stop your ship and eat its inhabi-

tants Astro Navigator runs on the RRC model R and costs f4.95 plus VAT

COMMANDING YOUR OWN **BATTLE ZONE**

TANK ATAK Tank Atak puts you at the controls of a tank deep inside enemy

From your screen mounted gunsight you can see enemy tanks, planes and flying saucers appearing from a range of hills in the distance. You must shoot these to score points but beware of their return gunfire which can destroy your tank in a split

Games players familiar with the arcade game Battlezone will welcome this addition to the software range available for the VIC 20. The game is a plug-in Rom cartridge and is available at £24.99 from Reading based Audiogenic

SOLVE THE SECRET OF THE SPHINX

SPHINX ADVENTUR

ancient Egypt against a back drop of pyramids mummies and

long drawn out test of your powers of reason and perseverance. You must collect treasure and bring it to the Sphinx - but watch out for the Trolls and Goblins who by some evil magic have

been brought to ancient Egypt to fleece you of your treasure.

Sphinx Adventure runs on the BBC model B and is available from Cambridge based Acornsoft at £8.65 plus VAT

Also new from Acornsoft this month is a four game pack for the RRC model R Arcade Action features four popular arcade games - Invaders, Breakout, Dodgems and Snake. The cassette is available at £10 plus VAT.



VIEET THE HAPPY EATER

THE GLUTTON, MOON LANDER

of the arcades are at it again This time they have munched their way into the Sharp MZ-80K in a new Pacman type game

called - appropriately enough The Glutton is guided through

the maze using four keys which love it up, down, left, or right. The Glutton's aim is to gobble up all the dots in the maze and then start eating his way through

the next one This new screen will appear

as soon as he has eaten all the

Just as in the arcade version. the ghostly quartet of creatures Inky Blinky Pinky and Clyde are hot on your little Glutton's tail. They are as anxious to eat him as he is to eat those dots Also new for the MZ-80K is a

space game called Moon Lander. This game is based on the time-honoured Lander tradition. You have to land a space ship on a barren and rocky planet before you run out of fuel and crash. Glutton and Moon Lander are available from Sharpsoft of London. Each cost £5.85 including VAT, postage and packing.





NEW PRODUCTS NEW PRODUCTS NEW PRODUCT

SPACE AGE VERSION OF THE STING

SWARM

The ultimate science fiction horror theme comes to computer

A queen bee is an uninvited quest on board an Interstellar space shuttle. Near Kroton - the fifth moon of the planet Zaro, an alien energising gas enters the ship through a damaged retrorocket. The humanoids on board are shielded from the gas by their helmet purifiers - but not

You arrive on the scene as a queen hee the size of a Harrier jump jet appears at the top of a bonus life for every 1000 poi your screen. She immediately scored - points are awarded for starts laving her eggs in a long snaking cocoon moving right and left across the top of your Atom in 12K and costs £4 95 plus screen. Armed only with a laser VAT from Leeds based Program base you must shoot accurately and shoot fast before the superbees hatch out and swarm to- for the Acorn Atom is a Dogfight wards you



the number of bees downed Swarm runs on the Acorn

Also new from Program Power

game. The action takes place in Once they start swarming their the middle of the ocean — both giant stings become difficult to planes operating from off aircraft avoid as they rain down from carriers. The object of the game above. You have three lives with is to shoot down your opponent

ALIENS

ARE ABOUT! 3D DEFENDER

WATCH OUT,

Seated in the cockpit of your Defender ship you'll witness alien attackers, meteors, and scintilating clouds flying head-on

The ground is also not far below and you must be careful not to crash into the hills.

Armed with photon tornedoes you will score 250 for each direct hit and 50 if you fly low enough to entice an alien to attack you. As the alien onslaught proceeds you must be cautious to keeping your shield strength - set initially at 10 and reduced by one each time you are hit by plasma or meteorites, and by two for a

collision or crash landing. Flying controls include a forward radar screen which shows

type game in which you have to shoot assorted aliens and travel you what to expect to find in to far flung fuel dumps to keep view a few seconds hence. A proximity warning tells you about imminent alien craft This 3D Defender cassette is

available from the Bath based firm J. K. Greye and runs on a Sinclair ZX81. It costs £4.95.



ALL THE FUN OF THE FAIR SHOOTING ARCADE

All the fun of the fair ground on bullets will turn to blanks. offer in Shooting Arcade one of

three new games from America. You move your gun with a joystick or using the keyboard and then take potshots at the

ducks, and jumping bunnies. Bonus points are awarded for hitting smiling faces. But don't 32 disc version; all games and mistake a smile for a frown - for if you hit a frowning face you clusive of VAT

Shooting Arcade has been imported by Hertfordshire-based Audio Video Offers for the Atari 400 and 800. The other two titles from the U.S., Pacific Coast Highstampeding elephants, waddling way, and Clowns and Balloons

are, like Shooting Arcade, available as either a 16K cassette or a formats costing £20.50 each, in-

your craft moving. Dogfight, Stock Car and Astro Warrior run in machine code for the Acorn Atom 12K and can be obtained from Leeds based Program Power at £4.95 plus VAT

There is also a Stock Car race

Astro Warrior is an Asternide

name which offers you 16 dif-

ferent tracks to negotiate.

WINGED AVENGER

with you before he is drawn into the fight himself.

The Drones attack relentlessly and their purpose is to soften you cede that you are a worthy oppoun for the more superior Invasion Force. The Invasion Force are the elite of the fleet - and they will fight on to the very end, often necessitating more than one

direct hit.

The Assailants also attack in three waves and combine a tendency to fly direct at your draw missile base - Kamakazi style -

with very heavy fire power. You have limited energy to fire your laser, which is capable of base shield which will protect £6.95 inclusive.

The Winged Avenger has count- you from flying debris and from

less Drones and an Invasion those of your opponents who Froce to send out to do battle wish to die in a blaze of glory by crashing into your laser base. If you survive these attacks the Winged Avenger must con-

> nent and will engage you himself He is armed with powerful Smart Lasers that lock onto your base and are guided for the kill.

Your only hope of vanguishing this seemingly unbeatable space pirate is to damage his central control and force him to with-

Winged Avenger is based on the popular arcade game Phoenix and runs on a Sinclair Spectrum. The game is available rapid fire, and to power your from Luton based Work Force at

Readthisad

You: "Darling, I've decided to buy a computer."

Her: ***++**??!!***@XX??££**??!!? off!"

You: "Yes, I know we could do with a new washing machine. But the new Dragon 32 Computer is much more important. It's the first computer actually designed for all the familyand it costs under £200!"

Her: ***++??!!@££??! fortune!"

You: "No, I'm not being selfish. Computers are for the whole family - and they're going to play a big part in the children's future."

Her: "Oh?"

From this point on, the conversation should follow more reasonable lines. Allowing you to fully explain the many advantages of the new Dragon 32 family computer.

32K RAMFOR UNDER £200.* For a start, the Dragon

For a start, the Dragon offers 32K RAM Your wife may not understand that, so just tell her that the Dragon's capabilities are truly massive - at least twice as powerful as its competitors, with some features you won't find even in more expensive units. The Dragon will give you all the power you're likely to need, and more, to create your own programs - along with

an exciting range of software which can do anything from helping with kids' spelling and arithmetic to creating your own cartoons.

THE FIRST FAMILY COMPUTER.

All of which brings you nicely to the point where you tell your wife just how much fun the kids will have with the Dragon. How it will save her all that

Television not included in price.



Space Invader machines. How it will magically translate simple typed instructions into beautiful drawings and designs using set, line, circle, draw, scale, rotate and paint features, in up to 9 colours - and play and compose

I to your wife.

SPECIFICATIONS

6809E MICROPROCESSOR. Pet, Apple, Atari 400, BBC Micro, and VIC 20 still have the less powerful 6502.

32K RAM (as standard). At least twice the power of similarly priced machines. Expandable to 64K RAM.

Featuring: ADVANCED GRAPHICS (set, line, circle, paint, print, draw, rotate and print using).

ADVANCED SOLIND 5 octaves 255 tones.

ADVANCED SOUND 5 octaves, 255 tones.
AUTOMATIC CASSETTE RECORDER CONTRO

9 COLOUR 5 RESOLUTION DISPLAY.

USE WITH ANY U.H.F. TV and/or separate P.A.L monitor PROFESSIONAL QUALITY KEYBOARD.

Typewriter feel. Guaranteed for 20 million depressions.

PRINTER (Centronics parallel).

JOYSTICK CONTROL PORTS.

with 5 octaves of music. How it will engross your children in mind-boggling adventures in dungeons and caves without even getting their knees dirty. And the Dragon works with any U.H.F.TV

THEYLL LEARN AS THEY PLAY.
And then you can casually point out that although the kids are having fun, they're also learning. And within a very short space of time, the whole family will be completely

at home with programming - with computer language - with every aspect of how computers work. Which can't do their future prospects any harm at all.

BRILLIANTLY SIMPLE INSTRUCTION MANUAL.

The Dragon is made in Britain, designed with the help of British Universities. And it's also worth remembering that the Dragon's instruction manual is clearer and easier to understand than any otherhomecomputer's.

That its top-quality keyboard is as easy to use as a typewriter, and so well made it's guaranteed for twenty million depressions.

TAKE THE FAMILY DOWN THE HIGH STREET.

And if she still wants to know more, take her to see the Dragon 32. It'll soon be available in most good stores - or you can send the coupon for further details.

And if you're one of our many ladv

readers, please accept our apologies.
Perhaps you'd like to read this ad to

your husband.

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	send me further information about the Dragon
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TV GAMES CENTRES TV GAMES CENTRES TV GAMES



IZARRE HEALTH CUTS

You will finally be able to out that them to score bonus points. The Biology O-level to good use when Imagic launches its bizarre game Micro Surgeon over here.

The patient is critically ill and the game challenges you to undergo a Fantastic Journey type mission into the bloodstream to save him.

Inside the natient's body, you navigate your way through the bloodstream, out-manoeuvring white blood cells that attempt to destroy you as foreign matter. Your mission is to remove a

tumour from the brain, a blood clot from near the heart and nicotine deposits from the lungs. But you must work fast as the natient will die within an hour if the operation is not complete.

Micro Surgeon is one of five exciting releases planned around Christmas time by the U.S. company Imagic through its distributors over here. Adam Imports. These four run on the Mattel Intellivision and go alongside a range of seven Atari compatible cartridges.

Anart from Micro Surgeon there is a version of the popular arcade game Donkey Kong, where you have to scale the outside of a skyscraper to rescue the girl from the clutches of the giant gorilla who is threatening to throw her off.

Just to make things a little more difficult the gorilla also has an inexhaustible supply of boulders which he is tossing down at you. You have to dodge these or, down on you from the eerie creaif you're brave enough, squash tures hovering above.

player that gets to the top and rescues the girl in the guickest time is the winner.

Swords and Sements places you in a maze-like dungeon where you have to do battle with Black Knights, dragons, gargoyles, and an army of enemy Knights.

You are befriended by a wizard who you take under your protection until he learns the snells that may help you both escape with the treasure that litters the dungeon.

Demon Attack is a fast and furious space attack game based on the popular arcade game Phoenix Atlantis - that mythical city

under the sea is under attack from alien spacecraft. Armed with a single laser oun you are charged with the task of resisting the alien onslaught.

WINGED WARRIORS

DEMON ATTACK The demons are attacking the ice

planet of Kybor. Armed with a laser cannon you must defend the planet's freezing surface from the demon fire which is being showered

THE WORLD OF TRON

TRON GAMES

With Tron the movie playing to nacked audiences across America and soon to open in the UK -TV names centre owners may soon he able to enjoy some ac-

tion on their own television sets. First in the field are Mattel with two Tron-based games for their Intellivision machine.

The games are based closely on the storyline of the latest Walt Disney production.

In Deadly Discs you do battle with a variety of computer controlled adversaries who chase you across a black grid. You are armed with an electronic frishee - disc which you fling at your opponents - just as in the film. If you score a hit your enemies will disintegrate.

In Tron-Maze-A-Tron you must penetrate the Master Control Programme, again just as featured in the film script. Sark -

the evil overlord of the computer will attempt to thwart you, sending out adversaries of "the most

Six other games for the Intellivision machine have now been in the shops since the Summer: Space Hawk, Lock n' Chase, Utopia, Frog Bog, Sub Hunt, and Night Stalker

Worthy of a particular mention among these is Lock 'n' Chase -Intellivision's answer to Pacman.

The game seemed a little slow by comparison with Atari Pacman and the Intellivision direction disc makes steering more difficult than with a joystick but the lock feature more than makes up for this.

It enables you to lock off sections of the maze by placing a little red har behind you in the maze to foil - just as your pursuers home in on you.



Points are scored each time you successfully blast a demon out of the sky. You are also awarded an extra

laser cannon for each wave of demons you manage to survive. The value of the demons increases as you go onto the next wave - up to the 12th wave when Demons are worth 35 points. Split Demons 70, and diving demons 140. From this stage onwards the points remain

the same. The Demon Attack cartridge gives you ten games in all to and will be in the shops in choose from - some for one and October.

some for two players. Games 1, 3, 5 and 7 pit you against progressively more diffi-

cult waves of demons The higher the game number the faster and more skilful the

Games 2, 4, 6 and 8 are two player versions of the above play alternating between both players. Tracer shots are also

featured in the two player ver-Demon Attack is manufactured by Imagic for the Atari VCS

CENTRES TV GAMES CENTRES TV GAMES CENTRES



FROGGER

amphibians of Frogger. A busy highway and a perilous river crossing stand in their way and they have only 30 seconds to

reach the home bays. Frogger is the second cartridge in the range of Atari compatible games from Parker Brothers to be available over

The trip to the breeding grounds here and it is a very close copy is life and death to the honoing of the arcade original.

Each frog must be guided through five crowded lanes of traffic, hopping between cars and lorries travelling in different

directions at varying speeds. Then he arrives at the river bank and is faced by a raging torrent, carrying logs downstream while turtles swim up it.

By judging leaps between these he will arrive at his home hav But our aquatic leaner must take care not to spend too long on the blue, diving turtles which will dip below the surface and surrender him to the current. On the bright side he could rescue a lady frog from the logs and carry

her home on his back. Alligators drift between the lons and their jaws will snan shut on any frog careless enough to

lean into them Points are scored for every frog safely home and bonuses for those who picked up a lady

friend or found a tasty fly meal. When all five frog bays are filled a set of new frogs come out to make the trip - only across more crowded roads and with fewer floating objects on the river. But watch out for snakes and allinators on the river banks

in the later stages Palitov markets the cartridge over here and it costs £29.50.

NNW-SOUND AND VISION

SPACE SPARTANS

Space Spartans and B17 Bomber feature the new Intellivoice speech reproduction system which reproduces voices fairly realistically

The Intellivoice Voice Synthesis Module plugs into the cartridge slot on the Master Component and then the special Intellivoice cartridges plug into this. The speech hox costs f69.95 from Intellivision stockists.

The battle computer - which is the speaking part of the game Space Spartans - tells you how you are progressing and warns of any imminent aliens.

Of the new games available for the Intellivision machine Star Strike was the one that stood out from all the others at a recent Mattell toy fair

It's 3-D graphics are both colourful and vivid. Alien ships buzz around you as the planet earth moves slowly across the screen - within range of the alien mis-

Intellivision cartridges are available from good toy shops at between £19 and £24 although the new Intellivoice cartridges are slightly dearer at £29.95

IAY THE FORCE BE WITH YOU

THE EMPIRE STRIKES BACK wise pilot puts down for repair at month this range of Atari-com

snowspeeder to defend the rebel base on Hoth from Darth Vadar's Imperial forces in this recreation of the fabulous battle from The Empire Strikes Back film.

The seemingly indestructable Walker Tanks prove formidable opponents as they plod inexorably closer to the rebels' reactor. Five Walkers, which resemble robot camels, approach the base hit in single file, spitting missiles from their heads and smart bombs from other parts of their anatomy It takes 48 hits to destroy a

Walker but each series of eight hits weakens and slows it, producing a tell-tale colour change. All five must be despatched before any one of them reaches the reactor which is placed at the end of a radar strip displayed beneath the screen action.

There is just one chink in the Walkers' armour, bomb hatches which flash open on the body and a direct hit on one of these will result in instant destruction.

The snowspeeders's are vulnerable in comparison, any hit will badly damage them and a Palitoy. As we mentioned last

one of the many recovery pits before risking further punishment. Smart bombs are more dangerous than ordinary missiles. They appear with a buzz and chase the snowspeeder around the screen as he tries desperately to outmanoeuvre it or blow it up. They may also destroy the craft with just one

Of course you couldn't have a Star Wars game without including the Force - that almost magical quality which enhances human performance - and if you can keep any snowspeeder alive for more than two minutes, the

Force is with you for 20 seconds. During those seconds the owspeeder is all-powerful and cannot be destroyed, make the most of this period to get in some telling hits.

The Empire Strikes Back is the first of the Parker Brothers range of cartridges to be released over here. We have already received good reports of its reception in the U.S. and it is being distributed over here by toy company.

natible cartridges is going to ex-siles. nand rapidly and some exciting

Empire Strikes Back should be in the shops now and costs



Probably the fastest microcomputer in the universe

the JUPITER ACE only £89.95.



All inclusive Price

For £89.95 you receive your Jupiter Ace, a mains adaptor, all the leads needed to connect to most cassette recorders and T.V.s. (colour or black and white), a software catalogue and a manual.

The manual is a complete introduction to the world of personal computing and a course in FORTH programming on the Ace.

Even if you are a complete newcomer to computers, the manual will guide you step by step from first principles to confident programming.

The price includes postage

Key Features

- Revolutionary microcomputer language FORTH.
- Full-size moving-key keyboard.
- User-defined high-resolution graphics.
- Programmable sound generator.
- · Floating point arithmetic.
- Fast cassette interface.
- Upper and lower case ascii character set.
- 24 x 32 character flicker-free display.

The Jupiter Ace uses FORTH

The Ace is set apart from all other personal computers on the market by its use of a revolutionary language called FORTH. Some computer languages are easy for humans to understand others are easy for computers. FORTH is most unusual rand, others are easy for computers. FORTH is most unusual in being both. Its underlying principles are so simple that it takes even a nexocomer to computers only a few minutes to learn how to do enough to allow you to invent your own extensions to the language reset.

At the same time, the memory-saving coded form used to store your programs inside the Ace allows it to obey them very fast rypically in less than a tenth of the time it would take to do the same thing using a different language. Amongst other things, this makes the Ace ideal for "games".

FORTH's unique combination of speed, versatility and ease of programming has already made it a prime choice for professional applications as diverse as pub games and radio telescopes, and gained it an enthusiastic national user group. Now the Jupiter Ace can bring this addictive language into your own home.

Designed by Jupiter Cantab

Leading computer Designers Richard Altwasser and Steven Vickers have a reputation for pushing technology forwards. After playing the major role in creating the ZX Spectrum they formed Jupiter Cantab to develop their latest brainchild the Jupiter Ace.

Technical Specification

Hardware

Processor/Memory Z80A running at 3.25 MHz. 8K bytes ROM 3K bytes RAM.

Input 40 moving-key keyboard v

auto-repeat on every key.

Output Memory-mapped 32 x 24 character display with high resolution user graphics. Outpi to drive normal UHF TV set on channel 36.

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loudspeaker.

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packing and V.A.T. Software, FORTH

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CHEOUERED MATES

The International Computer Chess Association (ICCA) was formed at the second world computer chess championship in Toronto in 1977 and has just celebrated its fifth anniversary. For its first quarter century of history, computer chess managed without any central organisation at all. events being run by eager volunteers distributed sparsely throughout the

By 1977 it was evident that a central organisation was needed to administer an activity which was already attracting much larger audiences than most human cham-

The latest issue of the ICCA newsletter includes analysis of all the game of the 12th North American Championship, won as so often by Ken Thompson's Belle. Here is a strong win by Duchess against the Sicilian Defence, from the first

White: Duchess. Black: Awit 1. P-K4, P-OB4; 2. P-O4. The Morra

2. . . . P×P: 3. P-OB3. P×P: 4. N×P. N-OB3: 5 N-B3 P-O3:

White has gained a lead in development at the cost of a Pacon. master level. White's opening can be a very strong weapon against

6. B-OB4. P-K3: 7. 0-0. N-B3: 8. O-K2.



makes an immedite mistake (9. . . . P-K4 is necessary).

The founding members of the ICCA were simply the competitors in Toronto. Five years later the membership stands at over 500 including a former world champion Mikhail Botvinnik, with branches in a num-

her of countries It has organised a further world championship in Austria and sanctioned a number of other events. Most importantly, the existence of ICCA has given computer chess a respectability with the conventional chess world.

ICCA has just ratified a co-operation agreement with FIDE (the International Chess Federation) and has worked nainstakingly for computers to be allowed to enter human tournaments, earn international gradings

Another mistake, which loses a piece. Black had to play the unis pinned against the Queen

White threatens to win the Knight by N-K4. Incredibly White is still 'in the book' at this point. After Black's next move, White begins to calculate its moves.



abcdefgh

12.... N-N5: 13. P-OR3. N-OB3: 14. B×N? (14. N-K4 is better, winning a piece for nothing. Now Black can win another Pawn for it's piece). 14 B×B: 15 N-K4 B×P ch: 16 N×B. O-K2: 17. O-R5. B-O2: 18. ORlowed by N-B6 ch wins quickly. N-N4 would still win after Black's next

18. . . . QR-R1; 19. N-Q6, B-K1; (White's 19th move was a mistake. simplifying the position when he still has many attacking chances). 20. N×B, R×R ch; 21. R×R, R×N; 22. N-B3. O-B2:

and even to be allowed to enter the human world championship cycle.

It is some indication of their success in raising the overall status of computer chess that there should now be serious debate about whether entering a computer in the world championship is reasonable - not long ago, it would have aroused nothing but laughter

The ICCA Newsletter — published three times a year - is currently the best source of up-to-date information about computers and chess.

Membership costs 10 dollars (U.S.) per annum and the secretary is Ken Thompson, Bell Telephone Laboratories, Room 2C2423, Murray Hill, NJ 07974, USA



abcdefgh

(Now 23, N-N5 threatens mate and thus wins the Pawn on K6. Black's KBP being pinned). 23. Q-R4, R-KR3- 24. Q-R2, Q×Q ch;

25. K×O. R-O1: 26. R×R ch: N×R: 27. K-N3, P-KN4? (weakening his Pawn structure for no reason). 28. N-O4. P-KR4: 29. K-B3? (P-B4 would show up the weakness of Black's Pawn structure).

29. . . . K-B1; 30. K-K4, P-N5; 31. K-B4. K-N2: 32, K-N5, P-R3: 33, K×P and





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LE STICK

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LUNAR LANDER	24k (c)	£12.50			FLEECE	(d)	£31.95
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PRESTEL

NEW PATHWAYS ...

Have you been through Prestel's (GATEWAY yet' That's the latest development on the viewdata ascene, and also brings Prestel to closer to the more familiar world of micro-computers. It is very much part of the current trend as Prestel starts to offer more to micro used starts to offer more to micro used adding viewdata interfaces and facilities. Increasingly viewdata will provide a service to micro users.

province a service to Marcro users. What is GATEWAY, and how does it fit in? Basically, a GATEWAY is a standard computer concept — that of linking together different types and makes of computer. This is often far from usery because different computer or because different computer or because of the computer of the com

The purpose of a GATEWAY is to set up standard rules and procedures to allow computers to talk to each other. This needs to be done at several levels, starting at the fundamental electrical level, and rising through more complex procedural and programming levels.

But once it is done, different computers can send and receive data and programs.

They often use the telephone system to do so using a special new ten to do so using a special new which means that instead of dialling which means that instead of dialling up somebody — or some machine — you send the data off into the telephone system bundled up into the little electronic packets, and the system then directs the packets to their destinations — much like ordinary letters, except that if all automatic, and at electronic speeds.

INTERACTIVE GAMES

In the last few months Prestel have set up their side of the GATEWAY, and a handful of other organisations have done their bit. First off the mark was Hatfield Polytechnic, with a GATEWAY into their educational database.



By Peter Linton

The second GATEWAY link was to games on Prestel. But via the GATEWAY link in the SATEWAY link in Darie's own computer, it's been possible to open up a couple of proper "interactive games, much more like proper mucro games. One is Bulls and Cows also known as Mastermind in which you have to guess a four-digit numpues the right number, and or its correct position.

GATEWAY ACTS

On Prestel, a game like that would take thousands of pages to cover all the permutations. In the Baric version, it needs just one page, plus a clever program behind it. The reason why it's cleverer than a microcomputer version we'll look at in a moment.

The other interactive offering on Baric is a biorhythms calculator, showing in graphic form whether you are emotionally, physically and intellectually up or down — or just in the critical inbetween stage.

Other games are likely to appear via GATEWAY soon, as other organisations get their GATEWAY acts together — technically it is fairly complex. Because of the limitations of Prestel graphics and the capacity of telephone lines, they will never be as fast or powerful as the beauticro or arcade games. But GATE-micro or arcade games. But GATE-

WAY will make Prestel games better — and more fun.

There is an interesting technical aspect in programming such games that you might like to experiment with on your micro.

A GATEWAY game like Bulls and Cows has to be able to handle more than one user at a time—

unlike a micro.

There might be 20 or more simultaneous users, all at different stages in the game. While some are thinking about their next quess, others

are typing it in.

KEEPING TRACK ...

So the first problem is that the program cannot simply start at the beginning, and run through to the end. It has to keep track of every user, what his previous guess was, and which part or segment of the program he should go to next.

That's the fundamental difference between what's called "batch" computing, where you do one thing from start to finish, and "online" computing, where you are connected to a program that is always live, never stops, and takes a large and changing number of users through the program.

Not only that, but the computer may have up to 40 different programs, with dozens of different users all expecting the machine to produce the right answers — and fast.

BE DYNAMIC

How would you write a program that could keep track of different users, what stage they were at, and which program line they should GOTO next?

The answer obviously lies in the direction of a dynamically updated look-up table, which tells the computer where it's at.

It gets fairly complex, but it's a vital aspect of modern computing, and one of the important differences between a micro and a mainframe computer.

Still once you've cracked it you can start work on a GATEWAY into your own micro.

THE FANTASTIC FREAK

TIPS ON TEMPEST

Tempest as we know it today is a game was intended to be a monster scenario - the cabinets being illustrated with hairy

Only just before the game was due to go on general release did the designers realise that the Atari video screen would not produce the required monster graphics

A new format was hastily worked out the cabinets repainted, and one of the most popular video games of the moment hit the arcades.

Tempest graphics are surprisingly distinctive considering the rushed manner in which the final product was conceived.

The game features sixteen different electrical force fields each inhabited by a series of colourful electrical enemy shorts. You are an open electrical circuit and your task is to electrocute the enemy in a highly charged force field.

Once you have destroyed the enemy in one pattern you are sucked through the centre of the screen and placed in a new electrical field with a new 3D pattern. Your controls feature a control

tuner on a transistor radio - it freak of design - the original moves you at great speed around all the onen lanes. It is your key to success in Tempest — and you must develop a feel for its sensitive reaction to touch.

The first button is fairly simple. You have an unlimited supply of ammunition so it is advisable to keep up a fairly constant harrane of fire. The Super Zapper must be used selectively as it can only be used twice in any one pattern. The first time you use it it will destroy all your enemies with the exception of the Spikes.

The second time you use the Super Zapper it will only destroy the enemy that it considers to be of the greatest immediate threat

Your electrical adversaries vary in aggressiveness and cunning - and so the points you are awarded for electrocuting them vary accordingly as well.

Trickiest of all are the Flippers which can flip from lane to lane and move at lightning speed. The hest way to deal with these ominous star shapes is to shoot them fast before they reach the end of a lane.

Tankers present little threat in themselves but you still have to nick them off before they reach knob which is rather like the the top of a lane as they will then

spawn two Flippers. If this hap-250, 500 or 750 points depending pens you will have to spin right on the level of play and fire and then spin left and Pulsars can short circuit lanes fire to pick off the two newly

cause you any harm Fuseballs are also difficult to deal with and are the key to high scores - particularly at the higher levels of play. These red. vellow, and blue snowflake structures are difficult to shoot as they change lanes and dodge up and down to avoid your fire.

Fuseballs are worth having at

and hem you in a restricted secborn Flippers before they can tor of the pattern as it is impossi-

ble for you to cross lanes that have been short circuited. Pulsars can only be killed when they are in the process of crossing lanes. Pulsars must be killed at the earliest possible opportunity They are worth 200 points. Spikers are slow moving ene

mies worth only 50 points but it is as well to get them early if you can as they can shoot spikes which can cause you problems when you try to move onto a new

There are basically two types of pattern in Tempest. Patterns that you can spin right round and patterns that you cannot spin right around In the latter case you must find a safe place at the right or left extremity of the pattern from which you can shoot your trickiest opponents.

Whatever the pattern shape the golden rule is to move and fire constantly. You will not stay alive long in Tempest if you stay in one place

Skilled players can choose to commence their game at a high-

er level - there are five entry levels. It is also possible to begin a new game where you left off if you have reached a sufficiently high level as long as you insert your coins within 30 seconds of the previous game ending

BIRD WATCHING ON THE FAIRWAYS

golf course. There are two balls to keep an

eye on in this game. The one which you address with your club on the screen and the "roller ball" which is the only control needed to play it.

The roller ball dictates distance of shot and accuracy by the speed and direction you run your hand over it.

It is a tricky piece of control which will quickly single out the skilful players. There are nine holes in the basic game with extra holes awarded to players

Take to the fairways of your local who notch up under-par scores arcade and see if you can club such as Birdies, Eagles and your way round this nine-hole Albatrosses, for one, two or three-under-par scores. Hence

the name of the game. The hole-in-one player won't have to him a round of drinks afterwards but he should notch \$ up six extra holes to play

The beginner must take care to look at the flag, which indicates how the wind is blowing. It a is possible for him to go out-ofbounds and forfeit a stroke or ruin his chances by going more than three over par - the machine can be altered by the operator to call a halt when so many strokes over nar are



scored by the player. Three is the most difficult setting. The holes increase in difficulty as the game goes on, but beginners have a good chance of progressing a good way into the

game and so learning it.

30 COMPUTER & VIDEO GAMES



WE'RE GOING

JUNGLE KING You may not be able to beat the

If the famous Ape-man Tarzan was your boy- (or girl-)hood hero be prepared for a few surprises in this video version of jungle life. For a start there's trouble with

film from Walt Disney Produc-

tions takes place - in case you

don't already know by now -- in-

side a computer. The hero of the

film is challenged to fight for his

life in a series of video style

Cheetah, the silly chimp and his monkey mates just can't seem to stay out of Tarzan's way as he swings through his jungle home.

The first phase of the game sees Tarzan swinging on the lianas that hang from the trees You must judge his jumps for him by use of a jump button and a four-way joystick. But watch out for those clumsy monkeys.

Having survived this aerial iourney between the branches, Tarzan's next task is fairly standard piece of daring-do, he leaps into the water to take on the

crocodiles. Armed only with a knife and making good use of the joystick and the stab button he swims along under water battling off the crocs and making the most of the available air pockets. Occasionally he will get trapped in an

lessly to the surface. The third stage of the game

The Cone Challenge is based

on Tron's attempt to get into the

MCP - the computer's nerve-

centre - before he can destroy

the cone shooting out all the col-

ourful bricks which appear -

one after the other, to block your

You have to rise up through

captured by cannibals!" And the nainted devils are lowering out heroine into the cooking pot too. The cannihals are armed with spears and Tarzan has lost his knife but must try to stay out of range of the spears and jump over the cannibals to perform his rescue

And then the whole sequence starts again except that things are speeded up, with more

The game comes with a nice line in graphics jumple noises and beat the chest-type Tarzan

Hot on the heels of Mr and Mrs Pac-Man-Bally's adaptation of a video game theme - comes a true pinball/video combination called Caveman.

Gottlieb are the people behind this innovation in pin-table design which features a video screen within the playfield. It's "The best of Both Worlds" as the publicity

blurb says. You have to trap the ball in one of two special channels before you'll get a crack at the video game feature. This is a maze type game which shows a caveman chasing various dinosaurs. But he in turn is pursued by a killer

Tyrannosaurus If this killer beast catches your caveman the ball drains and the

nintable is back in action. There is a joystick attachment at the front of the table which is used to direct the caveman around the maze when the video is activated.

Hitting targets on the table also affects play in the video game maze. Hitting drop targets and rollovers will replace Tyrannosaurus with bonus scoring Pterodactyls in the video maze. Hitting the vari-targets determines how long these flying horrors stay on the screen

Gottlieb hope that this combination will make video players take a look at pinball - and pinball players at video games.

We'd like to tell you a bit more about the game - but the table has proved difficult to track down, Gary Flower of the Pinball Owners Association says one member has reported a sighting of this intriguing pin - maybe someone out there has played on one? How about letting us know what you thought?

APE OVER TAR7AN

game but at least you can beat

your chest in Jungle King.

involves a steep hill and a landslide of boulders falling down it. Tarzan has two choices here, he can either jump over the low bouncing ones or fall flat beneath the higher ones.

air nocket and he carried help-The final scenario fulfils Tarzan's worst fears: "Jane, she OU'VE SEEN THE FILM

ur ability to steer round your poponent. You must draw a complete line with your solid slipstream around the bike which is chasing you

The Grid Bug test is the most difficult of all. The Grid Buns are a breed of computerised spiders who swarm down towards you, preventing your entry to the transporter, which will take you safely on to the next challenge.

The fourth challenge, Tank Chase, incorporates a Pacman type maze. You steer your tank through the maze seeking out your opponent at who you then to turn the gun turret.

games Arcade Tron is manufactured way. If you touch any of these by Bally Midway and goes on general release in the UK this 'de-rezzed". Tranology for being Autumn to coincide with the rekilled lease of the film. The Light Cycle is a test of The game is already a big sucyour speed of reaction and of cess in the United States. A nationwide competition has



points in a marathon eight hour The controls are fairly simple. You have a Gorf type joystick which you can grasp firmly in your whole hand, using your index finger to fire. You also have a knob which can turn Tron's arm through 360 degrees. There are four levels of play - all based on

already been played. The champ

clocked up more than a million



```
DEF FIN BLY, = INT (RND *x) +1

5 GO SUB 7200

5 GO SUB 7200

10 REP (SUB 7 SUB 7 SU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              NEXT 9
G0 5UB 7470
G0 5UB 4350
G0 T0 730
STOP RAW TOWNS
POR i=1 TO 8
READ d(i): REAL
NEXT i
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               PRINT

CONTROL BOARD

CONTROL TO S

FOR CONTROL 
3040
3050
3050
3070
3080
3090
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3110
3110
31160
3170
       0
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          0
540
550
550
70
2
704
770
7712
                                                                         GO SUB 2000
GO SUB 3000
GO SUB 4000
GO SUB 4100
LET WN=FN R
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         3180
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       PRINT H 182-1,0,000 100 NEXT 1 FOR i=1 TO 15 PRINT AT 0,1+2-1; CHR$ (i+64)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         3210
                                                                                                                                                                                                                   R(8): LET WESFN R
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3230
9,159
3250
4000
4010
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   NEXT i.B. DRAW 209,0: DRAW
PLOT 5.8: DRAW 209,0: DRAW
9: DRAW -239,0: DRAW 0,-159
RETURN
REM SPACECRAFT CODES
DIM $ (5)
RANDOMIZE
                                                                            LET rc=FN
LET rh=FN
LET k2=1:
                                                                                                                                                                                                                       R(4) #5
R(4) #5
LET k3=1: LET k5=
                     716 FOR 9=1 TO
720 GO SUB 4340
```

SPACE WATCH

U.F.O. sightings have been reported over a large area and the evidence is pouring into Space Watch headquarters.

You are in charge of the search teams which must be sent out to try and

You are in charge of the search teams which must be sent out to try and find the aliens before a similar agency from a foreign power can contact tham

The alien sightings are the clue to how they can be tracked down and the code (a sort of Close Encounters sounds sequence, except that it is in colour) which must be used in making contact.

Coloury which must be used in making contact.

There are five alien craft in the vicinity and the information you have so far received has tempted you to give each craft a name.

far received has tempted you to give each craft a name. The Mothership is always the same colour as the Watcher and appears in the centre of the screen.

The Chaser is so-named because of its speed, it flies rapidly across the boundaries of the land but never deviates from a straight line flight path.

The Howerer also follows a straight flight path but is slower, travelling

The Hoverer also follows a straight flight path but is slower, travelling just half a sector each turn compared to the Chaser's whole sector. The Watcher pursues a circular path either one or a half sector is crossed in a day.

But the enigmatic Destroyer follows no fixed route although it does seem to travel just half a sector at a time. This craft is the most easy to confuse in sightings as it may sometimes copy the flight patterns of the Hoverer and Watcher craft.

The aliens are wary of humans, and unless contact is made quickly there is a very real fear that the Destroyer will live up to his name.

is a very real tear that the Destroyer will live up to his name.

The aim of the game is to find the alien code of five colours and put them in the right order you will then be able to make contact.

Each search you undertake can be across, one sector, four sectors or 16 sectors of the board. But each search depletes your energy reserves and when these drop below six the Destroyer will move in to try and blow-up your Space Watch H.Q. Fach search is also nives a colour code. And only that colour of craft will

Each search is also given a colour code. And only that colour of craft will show up. If you key in red (2), only a red craft will show on your radar scan, all others will remain invisible. You will also be able to see which areas your opponent is searching and whether he linds any craft.

When you think you know the code of each craft you can try out your guess. Inputting the information in the order: Mothership, Chaser, Hoverer, Watcher, Destroyer. So, discovering which of the craft you are tracking, is

wattner, uestroyer, so, inscovering which of the chart you are necking, is which, is vital.

There are a couple of other twists: a red craft will not show up on a red background. And if you see the Destroyer moving close to your City HO (marked with a "1") and "2" for first and second observe) you can exceed

energy setting up a defensive screen around the HQ.

The game starts with UFO sightings coming in from the cities and these usually dictate the tactics for the rest of the game.

NS ON A SPECTRUM BY KATE CLEMENTS

Š	RUNS	ON	<u>a spe</u>	<u>ctr</u>	UM				300
	4030 4050 4055	NEX LET SI	1)-s(4)	TO !	R (5	+1			4432 4434 4436 D 5UE
	4110	REM	PLOT My=F mx=F	NR	(6) +	P05	ITIO	NS	4440 4441 4442
	4130	IF	z (my,	mx)	=5 (1	THE	N GO	TO	
	4140	IF	z(my,	(xm	>6 T	HEN G	D TO	41	4448
	4145 B 480	LET	k = 1:	GO	SUB	4700	. GO	su	4453
	4150	LET	cy=F cx=F k=2:			4700	: GO	su	0 SUE 4457 4460 4462
	4180	LET	hy=F hx=F k=3:			4700	: GO	su	4465
	4210	LET	wy=F wx=F k=4:			6 +5 4700	: GO	su	4490
	4230	LET	dy=F dx=F k=5:			4700	: GO	su	UB 83 4506 4510 4515
	4250 4340 4343	REM	MOVE	21	aft.,0;"	City	chec	k o	4540 1: G0 4550 5: G0
	4350	LET	k = 1:	GO	SUB	4700	: GO	su	
	4350	REM	y=wy SUB 5	: L	ET X				4500 4505 4510
	4401	LET	80 = 8	n+2	: IF	₩n=9			
	8 48 4415	DET GO	SUB 4	700	820	4700 SUB			4630 4635 4640 4660
	4422	LET	y=cy SUB r	: L					4665
						TO 4 4700	434 : GD	รม	4675

B 4850

DI RAIL OLLMERTO
4432 IF k2=2 THEN GO TO 4550
4434 LET k2=1
D 5UB 4820
4438 GD SUB 5000
4440 REM hoverer 4441 LET k=3
4442 LET Y=hY: LET X=hX
4445 GO SUB rh+4620 4446 IF k3=6 THEN GO TO 4453
4448 BD SUB 4700: GO SUB 4850
4452 IF k3=3 THEN GO TO 4560
4456 GO SUB 4700; GO SUB 4800; G
0 SUB 4820 4457 GO SUB 6000
4450 REM destroyer
4462 LET k=5 4465 LET y=dy: LET x=dx
4470 LET rd=FN R(4) +5
4480 GO SUB rd+4655
AAGO TE KSES THEN GO TO 4540
4500 GO SUB 4700: GO SUB 4800: G
0 SUB 4820 4505 IF ea (5 THEN LET p3=1: G0 S
UB 8300
4506 IF eb<6 THEN GO SUB 8300 4510 GO SUB 5000
4515 RETURN
1: GO TO 4470
4550 LET cysy: LET cx=x: LET k2=
5: GO TO 4425 4550 LET hysy: LET hx=x: LET k3=
E. CO TO AAAR
4500 LET CX=CX+2: RETURN 4505 LET CX=CX-2: RETURN
4510 LET CUECH+2: RETURN
4615 LET CHECH-2: RETURN
4630 LET by=bx-1: RETURN
4540 LET hy=hy-1: RETURN 4560 LET dy=dy+1: RETURN
ARRE LET dy=dy-1: RETURN
4670 LET dx = dx -1: RETURN 4675 LET dx = dx +1: RETURN
AZOO DEM check coordinates
4710 IF K=1 THEN LET f=mx: LET 9

```
RETURN
IF k=2
RETURN
    4790
                                                                                                     THEN LET FECK: LET 9
    =CU:
                                                                                                     THEN LET
                                                                                                                                                                                     fabr.
                                                                                                                                                                                                                                       I FT q
                                             RETURN
    =h4:
                                           IF K=4
RETURN
IF K=5
RETURN
                                                                                                       THEN LET
    =89:
4750
                                                                                                     THEN LET
                                                                                                                                                                                       Fady.
                                                                                                                                                                                                                                       LET
                                         REM remember craft position
    $
4819
4815
4829
4825
4850
                                             LET h (g, f) =k
                                                                                                                                                                                                                                                                                                      6610 PRINT HI
ER 8; "#"
5620 PAUSE 100
6630 PRINT AT
                                         METURN
REM borders
IF f(1 THEN GO SUB 5000
IF g(1 THEN GO SUB 5000
IF g(2 THEN GO SUB 5000
IF f(30 THEN GO SUB 5000
IF f(30 THEN GO SUB 5000
                                             LET h (y,x) =0
RETURN
                                                                                                                                                                                                                                                                                                                                                                                                                        ucasai.xcasai: PAR
                                                                                                                                                                                                                                                                                                                                           LET q1=1
IF en>0 THEN GO TO 6650
CIRCLE v1,v2,cc: RETURN
CIRCLE v1-8,v2+8,cc: RET
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RETURN
                                           RETURN
REM redraw towns
FOR L=1 TO 8
PRINT AT d(l),e(l);"
PRINT AT d(l)+1,e(l);"
                                                                                                                                                                                                                                                                                                      5850 CIRCLE V1-8.V2+8.CC: HEIDMN 7427 GO 5UB 7480: CL5 7430 PRINT "But a warning if your energy is below 6 the Destroye 7435 PRINT "in and bomb your cit y H0 if it is flying over that city sector": PRINT "The first 7437 PRINT "The first
4950 NEXT | d(1)+1,e(1); "-

4950 NEXT | d(1)+1,e(1); "-

4950 PRINT AT 10,22; "2: PRINT A

4940 PLUT 8,5: DRAW 259,6: DRAW

0.150 DRAW 259,6: DRAW 0,-159

5000 RET bange avve

5000 IF k=2 THEN 194
                                                                                                                                                                                                                                                                                                 y HO il ti

"Club setto" ": PRINT "The first

player's city is shownwith a ir

7440 PRINT "You can prevent this

7440 PRINT "You can prevent this

up a screen around your town."

7450 PRINT ": PRINT "Important:

7450 PRINT ": PRINT "Important:
                                                                                                                                                                                                                                                                                                          A48 PRINT RATIONAL SERVICES OF SERVICES OF
                                             IF k=3 THEN GO SUB 5130: RE
                                             LET k5=5: RETURN
LET k2=2
IF rc=5 THEN LET rc=10: RET
                                                                                                                                                                                                                                                                                                      5 his
7450
7460
  URN
5115
TURN
5120
5140
                                                                                                                                                                                                                                                                                                      inue
                                             TE cc=15 THEN LET cc=20: RE
                                             LET rc=rc-5: RETURN
                                                                                                                                                                                                                                                                                                      7465
7470
7475
                                                                                                                                                                                                                                                                                                                                                                               which player
1=1 THEN LET t=2: GO TO
                                                                   thas THEN LET thate: RET
                                                                                                                                                                                                                                                                                               7 tea THEN LET tea: GO TO 7680 IF tea THEN LET tea 1 t
    5145
                                           AF Cha15 THEN LET Ch=20: RE
                                           LET rharh-5: RETURN
REM watcher circle
IF what THEN LET wx=wx-wm:
    RETURN
5520 IF wh=2 THEN LET WX=WX-WB:
) FT WU=WU-WB: RETURN
                                    WY=WY-WB: RETURN
IF WN=3 THEN LET WY=WY-WB:
    5530
RETU
                            URN
    RETURN
5540 IF wn=4 THEN LET wx=wx+wm:
LET wy=wy-wm: RETURN
S550 IF wn=5 THEN LET wx=wx+wm:
                                UNN
2 IF wn=6 THEN LET wy=wy+wm:
wx=wx+wm: RETURN
2 IF wn=7 THEN LET wy=wy+wm:
URN
    5550
    LET S570
                                                                                                                                                                                                                                                                                                    100
7530 LET c$="Do you want to gues
s atien code?": GO SUB 7900
7540 INPUT i$: IF i$="y" THEN GO
SUB 8000 LET
7580 LET c$="How much energy wil
                                  O IF wn=8 THEN LET WX=WX-WB:
Wy=wy+wB: RETURN
0 REM craft over cities
0 IF z(g,f)>6 THEN GO SUB 605
    5580
                                                                                                                                                                                                                                                                                                 305 5000 is IF 15 "9" THEN GD 7880 LET 25 "HOW SUCh energy sil 7880 LET 25 "GO SUB 7900 7500 IF 600 F. Nove the control of the
    8020 IF
                                         RETURN FOR j=1 TO 8 THEN GO SUB 6 IF z\left(g,f\right)=j+6 THEN GO SUB 6
                                         NEXT J: RETURN
PRINT AT d(j)+1,e(j); INK s
    (k): "*"
5090 PAUSE 200: PRINT AT d(j)+1,
    6095 RETURN
  5095 RETURN COLOUT Check 5500 RET COLOUT Check 5510 LET Ca"Please put in your colour check 5500 LET Ca"Please put in your colour check 5500 LET Ca"Please re-enter: between 2 and 6": GO SUB 7900: DO TO 5520 LET CA 5540 LET 
                                                                                                                                                                                                                                                                                                      7640 LET c$="Please re-assess
ergy use": GO SUB 7900: GO TO
85
                                                                                                                                                                                                                                                                                                    SST - LET cam'I need a central co
Toddinate to": GD SUB 7000
Toddinate to": GD SUB 7000
Toddinate to Sub 7000
Toddinate to Sub 7000
Toddinate to Sub 7000
Toddinate to Sub 7000
Sub 7000
Sub 7000: GO SUB 7040
Toddinate to
  5550
                                             IF en=1 THEN LET V3=-3: LET
                                           IF en=5 THEN LET v3=-5: LET
                                                                                                                                                                                                                                                                                                      7670 I
0 7720
7680 I
                                                                                                                                                                                                                                                                                                                     00 IF
    5557 FOR 1 = v3 TO v4: FOR j=v3 TO
                                                                                                                                                                                                                                                                                                      0 //20
7680 IF en=1 THEN LET ce=1: LET
cc=16: GD TO 7700
7690 LET ce=2: LET cc=32
    6560 IF h (yc +2+i ,xc+2+j) =0 THEN
```

7700 IF yc(=ce OR yc)=(12-ce)
EN LET cap"your search is too
ce of cappe": GO SUB 7900: GO
7710 IF xc(=ce OR xc)=(17-ce)
EN LET cap"your search is too
ose to edge": GO SUB 7900: GO
7542 7050 INK 6: PRINT AT 5,8; "YOU AR E ENTERING": PAUSE 30 7050 PRINT AT 7,7; "A PROHIBITED ARER-": INK 7: PAUSE 30 7070 PRINT AT 9,10; FLASH 1; "SPA 7878 PRINT AT 9.387 FLEAN 1. SPA
TO SEE THE PRINT AT 1.9. PLEAS THE PRINT AT 1 38,420 ESBE VINCESIO-1: LET V2=175-7720 LET V1=175-7720 LET V1=175-7720 LET V2=175-7720 LET V1=175-7720 LET V1 The control of the co 7940 INDIVISION WATER THE TOTAL THE " RETURN SO20 PRINT RT 7.0; "Hothership,Chase, Hoverer,"
80:30 PRINT "Watcher,Destroyer."
80:30 PRINT "TO 5
80:50 INPUT L: IF L(2 OR L)6 THEN
80:50 PRINT INK L; "A": IF L()5(1)
THEN 80 TO 50:00 The reports towns in the control of THEN GO TO 5100 8070 NEXT i "Correct:" 5080 PRINT "Correct:" 5085 IF t=1 THEN PRINT as;" is t he winner" 5050 IF t=2 THEN PRINT bs;" is t he winner" 8095 STOP side PRINT "brong: the correct an need to separate the second of 7345 PRINT "": INK 7350 PRINT "The cr INK 1 in order, Side PRINT IN 5: PRINT INK S(i slice) PRINT INK S(i slice) PRINT in NEXT i slice in the winner": STOP slice in the winner": STOP slice in the winner is stop print as," is the winner is stop print as," is the slice in the print as, " is the print as," is the print as, " is the prin are:" "Hothership-never mov 7358 PRINT "Chaser-fast straight 7358 PRINT 7362 PRINT 1 lights" 7366 PRINT 7370 PRINT "Hoverer-slow straigh "Watcher-circles"
"Destroyer-slow rando IF p2=1 THEN RETURN
IF p3=1 THEN GO TO 8360
IF dg (9 OR dy)10 THEN RETUR 8350 IF dx (22 OR dx >23 THEN RETU 8355 LET c\$="The destroyer ombed your HQ": GO SUB 7900 8357 PRINT AT 21,0;a\$;" is has b 0 energy.
7935 PRINT "4 sectors=1 energy:
16 sectors = 5 energy.
7400 PRINT "16 sectors = 1 energy:
7400 PRINT only show "The colour of the same colour.
7405 PRINT "The codes can be 2-5 .
Matching craft colours of: red
pagenta, green.cyan and yetlo the w 8360 IF dy (11 OR dy > 12 THEN RETU 8370 IF dx <10 OR dx >11 THEN RETU 3380 LET cs="The destroyer has bombed your ho": 50 5UB 7900 8390 PRINT RT 21,0;bs;" is the without "STOP 7410 PRINT "A olour back gron a search" 7420 PRINT "": agga print at 21,0; bs;" is the winner: STOP defence below to the process of the winner: STOP defence below to the process of the winner: STOP defence below to the process of the winners: OD 5000 7900 addustrers: OD 500 79 "A craft on its own concord will not show on a search... INK 0: PRINT "By Searching the player will dis-co ver the colour code of each" 7428 PRINT "He can then enter th e codes (in the right order) and codes 8530 LET P2=1 8550 RETURN 7000 REM players names 7010 BORDER 0: PAPER 0: CLS : IN

7020 FOR i=1 TO 30 7030 LET t=FN R(255): LET U=FN R (175) 7040 PLOT t,U: NEXT i



WORD SEARCH

RUNS ON A ZX81 IN 16K

DI TODON COCHUAN

Why not dip into your Oxford English Dictionary and engage your ZXS1 in a war of words? This was in for the more literary minded among you —

a sort of computerisen crossovers.

You simply type in up to nine words all the same length — anything from two to nine characters. The computer will then hide them in a 15 by 20 matrix jumbled up with other random letters. All you have to do is find where the computer has

You have to tell it the co-ordinates of the first effor, the direction of the word and the number of he word. As you find the words the computer

```
HERE IS A LIST OF THE

MERIBALES USED:

A$115,80) THE DISPLAYED ARRAY
OF LETTERS UDBDS.

NUTF THE NO. OF UDBDS.

LENGTH LUGBDS.

LENGTH LUGBDS.

LENGTH LUGBDS.

LENGTH LUGBDS.

THE TO FIND THE

US (NU, LENGTH LOFT OF

THE RIGHT OF THE

DESTRUCTION OF THE

S$ 10000 STREETING OF

THE NO. IN THE LIST

O.U.Y.Y.Y.Z. GENERAL. USBITABLES

O.U.Y.Y.Y.Z. GENERAL. USBITABLES

O.U.Y.Y.Y.Z. GENERAL. USBITABLES
```

```
RAND
DIM A$(15,20)
PRINT ,"WORD SEARCH"
PRINT ,">>>>*<///>
GOSUB 9000
PRINT AT 6,0;"HOW MAI
                         6.0; "HOW MANY WORD
                     OR 5>9 THEN GOTO 50
                 AT 6,0,"HOW HANY LETT
ACH WORD"
"HAVE 2"
KEY$="" THE
$= TNP
                  KEY$="" THEN GOTO 85

$=INKEY$

DE (8$) (30 OR CODE (5$)

GOTO 85

ENGTH=CODE (5$)-28

AT 6,0;"
       DIM U$ (NU,LENGTH)
FOR Z=1 TO NU
PRINT AT 21,0; "WORD "; Z; " ?
           R S=1 TO Z-1
X$=U$(S) THEN GOTO 120
XT S
T_U$(T) - Y
                    X$ (X$) (>LENGTH THEN GO
                5
U$ (Z) =X$
                Z=1 TO NU
Y=15
X=20
RND=INT (RND+0)+1
0 RND+100+1000
       FOR X=1 TO 20
FOR Y=1 TO 15
                                  " THEN GOSUB 3
             A$ (Y, X) ="
        PRINT AT Y,X;A$(Y,X)
NEXT Y
NEXT X
                325
S$=CHR$ (INT (RND*26)+3
310 LET AS (Y, X) =09
```



1350 LET MEY, X-U = Us (2) (U TO U)
1350 NEXT 0 (2)
1350 NEXT LET A\$ (Y-U, X-U) = U\$ (Z) (U TO NEXT U GOTO 230 GOTO 230 LET Y=INT (RND+Y)+R+LENGTH LET X=INT (RND+X)+1 FOR U=1 TO LENGTH IF R\$(Y-U,X) <> " "RND A\$(Y-U,X) (U TO U) THEN GOTO 1: LET AS(Y-U,X)=US(Z)(U TO U)
MEXT SSS
MEXT SSS
MEXT SSS
MEXT SSS
MEXT SSSS
MEXT SSSS
MEXT SSSSS
MEXT SSSSS
MEXT SSSSS
MEXT SSSSS
MEXT SSSSSS
MEXT SSSSS
MEXT SSSS
MEXT SSS
MEXT SSSS
MEXT SSS
MEXT LET A\$(Y,X+V) = U\$(Z)(V TO V) NEXT V GOTO 230 LET X=X-LENGTH

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TY to enter the Plotala and steal the golden teapot of the Dalai Lama. There are not ne's trags and pillalis but even some magic trying to stop you from getting to the private

THE WIZARD OF SHAM THE WILARID UP STAM
you can reach his hide-out, then he will give you the elact of life. Travel through the
you, it is a short town of Sham and find the secret entrance to the temple in which the
licited hides. Once in the temple you will need all your skills and determination to avoid
we demoners assistance you. You may meet the witzerf in the end, but we doubt it...

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THE 7 CITIES OF CIBOLA

THE DOMED CITY HE DOMED CITY
ou are travelling through unmapped territory and your way is blocked by a giant
sep, (if y a heak mutation these arts are as big as you and there is only one way op
rough the art's lair. Some ants are triendly, others are aggressive, and your weap
the art's lair. Some arts are triendly, others are aggressive, and your weap
to be a separate or an artist of the artist and or an artist or artist or an artist or an artist or an artist or artist

THE TOWER OF BRASHT

THE GHOST OF RADUN

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PETER RABBIT AND FATHER WILLOW

PETER RABBIT AND THE NAUGHTY OWL

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TUMMY DIGS GOES WALKING IN THE FOREST

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BATTLE OF THE BULGE

BATTLE OF THE RIVER PLATE CONVOY

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information.

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1010 LET Y=Y-LENGTH +Y)
1020 LET Y=1MT (RND+X)
1040 FDR U=1 TO LENGTH
1040 FDR U=1 TO LENGTH AND A81
2050 LET X=10 LENGTH AND A81 2410 LET X=X-1 2420 FOR U=1 TO LENGTH 2430 IF As(Y-U,X+U) ()Us(N) (U TO U) THEN GOTO 400 140 NEXT 1400 V CUS (N) (U TO 1440 V CUS (N) (U TO 1440 V CUS (N) (U TO U) (U TO NEXT U G0T0 230 IF (Y-1)+LENGTH>15 THEN G0T FOR V=1 TO LENGTH

IF A\$(Y+V,X) (>U\$(N) (V TO V) SARE UP TO LENGTH 20 THEN GOT O 400 TO 100 THEN GOT O 400 TO LENGTH 20 THEN GOT O 400 TO 100 THEN GOT O 400 THEN GOT O 4 (X-1) +LENGTH > 20 THEN GOT 1988 PET 08 (7 40) XX (3DS (N) (U TO U)
1988 PEXT UT
1989 LET YXX*1
FOR 0=1 TO LENGTH
FOR 0=1 TO LENGTH
FOR 0=1 TO LENGTH
LET 0=000
NEXT US (0) US (N) (U TO U)
LET 0=10 (U TO U)
PRINT RT Y.X*-U CHR\$ (0)
PRINT RT Y.X*-U CHR\$ (0)
PRINT RT Y.X*-U CHR\$ (0)
PRINT RT Y.X*-U CHR\$ (0) 8918 PRINT AT 21.0."
8938 IF INKEY\$="""THEN GOTO 8328
8938 IF INKEY\$=""TO 1) <> Y" AMD I
NEE'\$("TO 1) <> W" THEN GOTO 8328
8948 IF INKEY\$(TO 1) = "Y" THEN G OTO 5.8
9000 5.5
9000 5.7
9000 PRINT
9000 PRINT
9000 PRINT
10 THIS GAME, YOU T
YEE IN SOME
10 FT
10 FT 175 PRINT RT N.4. 2240/CHRS (0)
180 NEXT NUTFENDITE:
180 ACT 1.40
180 PRINT "LENGTH (2-9 LETTERS) SOLO PRINT COMPUTER UILL THEN H
SOLO PRINT IN A 15 BY 20 HATRIX
COUNTED TO THE SOLO PRINT IN A 15 BY 20 HATRIX
COUNTED TO THE SOLO PRINT IN A 15 BY 20 HATRIX
OUT HOUSE TO THE SOLO PRINT IN THE SOLO PRINT THE THINGS OF THE SOLO PRINT IN A THE COORDINATES
OF THE THE SOLO PRINT THE COORDINATES FOR U=1 TO LENGTH LET Q=CODE (U\$(N) (U TO U)) LET 9=CODE (U\$(N) (U TO U))
LET 0=9+128
LET U\$(N) (U TO U) =CHR\$ (3)
PRINT AT Y-U,X-U; CHR\$ (0)
PRINT AT N+4,22+U; CHR\$ (0)
LET NUTF=NUTF-1
GOTO 400
IF (Y+1) -LENGTH:1 THEN GOTO OF THE "
9100 PRINT " B: THE DIRECTION OF THE WORD"
9100 PRINT " B: THE DIRECTION OF THE WORD"
9100 PRINT "C: THE NUMBER OF THE WORD"
9100 PRINT "DIRECTION: 4 5 6 300 200 310 320 330 THEN LET Y=Y+1 FOR U=1 TO LENGTH IF A\$(Y-U,X) (>U\$(N) (U TO U) GOTO 400 NEXT U 33.6 FOR U=1 TO LENGTH (10 TO U) 33.6 FOR U=1 TO LENGTH (10 TO U) 35.6 LET 0=100 E (U) 10 TO U) = CHR\$ (0) 37.6 PERM THY (10 TO U) = CHR\$ (0) 37.6 PERM THY (10 TO U) = CHR\$ (0) 60 NEXT (10 TO W) 50.6 LET NUTF = NUTF = 10 TO TO U = CHR\$ (10 TO U) 50.6 LET NUTF = NUTF = 10 TO U = CHR\$ (10 TO U) 50.6 LET NUTF = NUTF = 10 TO U = CHR\$ (10 TO U) 50.6 LET NUTF = NUTF = 10 TO U) 50.6 LET NUTF = NUTF = 10 TO U) 50.6 LET NUTF = NUTF = 10 TO U = 10 TO U) 50.6 LET NUTF = NUTF = 10 TO U = 10 TO 9150 PRINT 218 FOR S=1 TO 200 9198 9288 9218 9218 9228 9999 NEAT CLS
CLS
RETURN
SAVE "WORD SEARCHS"
GOTO 5 OR (X-1)+

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90 day warrant £169 + VAT + £2.50 Carr. SINGLE BOXED WITH POWER SUPPLY £199 + VAT + £4.50 Carr £369 + VAT +£4.50 Carr.

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DRAGON 32 tane PRICE \$169.00 + VAT and \$4.50 care

6809 microprocessor based computer with 32k Ram and microsoft colour Basic, hi-resolution



10 CLEAR 0

11 IN. "INSTRUCTIONS(Y=1; 2=NO)"V: IF V=1 G.300

15 B=32928

16 IN. "DIFFICULTY 1-6"F 17 CLEAR 0

18 IF F>6 G. 16

20 F. I=1 TO F; A=A.R. %32+33249

38 78=42 35?B=64

36 78=102 37 ?R=64

38 IF ?(B+32)=42 G.100

39 IF B=32960 G. 200 40 N.

45 F. I=1 TO 6; WAIT; N.

50 P.\$10\$24

60 LET C=?#8001

70 IF C=127 THEN LET B=8+1 80 IF C=191 B=B-1

81 IF B<32928 B=32928 85 7B=182

86 IF ?B+32=42 G.100

90 G.20

100 P. "YOU CRASHED"'; LINK#FFE3; RUN

200 P. \$12\$7\$7"YOU DID IT THE MINERS THANK YOU"; E.

300 P. "FERRY"".

310 P. " A MINING COLONY HAS BEEN SET "'"UP IN AN ASTEROID 320 P. "FIELD IT"'"IS YOUR JOB TO CONTROL THE "'

330 P. "ROBOT SHIPS THROUGH THE ASTEROID" "FIELD TO SUPPLY 340 P. "THEM"' "CTRL-LEFT"' "SHIFT-RIGHT"''

350 P. "Press any key to run" '; LI. #FFE3; G. 15

MINING COLON

Out in the depths of darkest space there is an asteroid mining colony plundering the riches of the universe. The miners dig up minerals which are turned into products like solar powered washing machines back on Earth.

But the colony is running low on supplies. The robot ships are on their way - but an asteroid field blocks their flightpath. Your job is to act as an air traffic controller and guide the supply ships through the asteroids and down on to the planet.

The ships are controlled from Atom flight command by using the CTRL key to move left and the SHIFT key to move right.

RUNS ON AN UNEXPANDED

ACORN ATOM

ROBERT CAMPBELL

COMPUTER & VIDEO GAMES 41



Wild Strawberries

OR A+8 TO 1271READ 8:POKE 18248+A. BINEXT A OR A+8 TO 55:READ 8:POKE 18448+A. BINEXT A IM A(15).8(15).8(15).0(15).0(3).8(3).8(3).8(3).4(3).1(3)

FOR A=1 TO 1516(A)=0816(A)=0816(A)=0816(A)=0816(A)=081(A)=081(A)=0816(

28 ORAPHICS 17#FORE 756.48
22 COLON SENTOT 1.810EMENTO 3.0#FORITION 6.8:FRINT #61*SCORE "18
28 SETCOLOR 6.12.6:SETCOLOR 1.6.4:SETCOLOR 3.5.4:SETCOLOR 3.6.6:SETCOLOR 4.14.8
20 COUNT 20011F HIGH THON GOTO 1108

NLOR 41RESTORE 56:FOR A=1 TO 5:RERO D OT 0:8+1:DRRWTO 19.8+1:NEXT A NLOR 56:FPLOT 19.23:DRRWTO 0:23

18 A-210-INT (MODIFICATION)

8 B-INT(MOD(1)+18-1)-11F 8-C THEN 208

58 COLOR 126-PLOT 8-A:C-8:COLOR 133-PLOT 8-A-1:0-0-1

58 LOCATE 8-A-1:FIF F-96 THEN 208

30 IF CAS AND RSQC1) (0.45 THEN COLOR 135-PLOT 8-A:SOTO 248

18 IF FWA THEN COLOR 124/FLOT 8.01COLOR 133 50 AHAP-11FLOT 8.01COTO 258 00 COLOR 135/FLOT 8.01FOR CH1 TO D 18 RESTORE 56/8-INT(RND(1)+18+1)*C-INT(RND(1)+5+1) 18 FOR FWA TH CLASSON CHNST(1)+18+1)*C-INT(RND(1)+5+1)

28 FOR F=1 TO C-MEMO GAMENT F.
28 FOR NET-TO INCOME BOUGHT F-03 THEN FOR 100TO 318
35 NEXT 01 TO INCOME BOUGHT F-03 THEN FOR 100TO 318
35 NEXT 01 TO INCOME SOCIETION 133 FROT BOOK 1
80 FOR NET 01 TO F-04 FOR F-04 FOR POSITION FOR 174, 043 THEN COLON 133 FROT B-0100LO

358 LOCATE 8, G-1, FFIF FWS6 GR G-4 HAD MAD 133 568 IF F#4 THEN COLOR 134: PLOT 8, G:COLOR 133 378 G-6-1: PLOT 8, 6:60TG 358

100 NEXT E:RETURN
190 CDLOR 169:PLOT D(1)-E(1):CDLOR 68:PLOT X.Y
400 ED0 8:1 TO PLIF D(8):=18 THEN 518

460 FOR \$61.1 THE TEE 18 IF ((0.1-1 THE TEE 18 IF (0.1-1 THE TEE 18 IF (0.1-1 THE TEE 18 IF (0.1-1 THE TEE) TO SEE TO

2-490 490 8 IF F-2 THEN E(8)-E(8)+1:1(8)+1:5(8)-1:50TO 45 You won't get a chance to pick your own when the Wild Strawberries get on your trail. This bunch of furious fruits are not the sort to be covered in cream and devoured. They roam the vegetable patch in search of unwary gardeners — who will come to a sticky end.

You use your Atari joystick to guide your workman around the different levels of a garden on a network of ladders and pathways. The gardener has to eliminate the rampaging strawberries by quickly digging a pit to trap the advancing fruit.



RUNS ON AN ATARI 400

IN 16K WITH JOY STIC

RY STEVEN PERKIN

The strawberries fall into the pit - but there's a big snag. The strawberries will only stay trapped for a few seconds - and to finish them off the gardener must push them through the holes so they will fall to the bottom level of the garden and find themselves in a real iam!

Each new frame provides a different network of ladders and paths and more strawberries. The game gets harder and harder as you become more skilled at picking off the deadly fruit. You'll eventually come across a really tough breed of strawberry which can only be killed by pushing from a greater height. Strawberries and cream will never be the same!

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IT 0-13. TIGS. Bright (Bright) IF (Bright) Bright (Bright) Bri
                                               19 3-2 G 08 4-2):9 THE 408

LOCATE 1-2-2-4-118 AMEST THE SEE

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                                                      1 518 CDD8 1789-R.GT 5189-E189-1500AD 3-28-6-189F0R D-) TO 189NEXT C CDD8 1289-R.GT 5189-K.GT 51
                                                      FDR ARE TO $180,000 2.228-0418.4.9-042100.08 172401FLOT X-THURBUR BREINEXT R
SOUND 2.8.6.100,000 R FREDT X-Y-100808 SSB
HHM-11F HHB THEN 1800
OHEIF FHA THEN 1800
OHEIF FHA THEN FRIJING-T
7 HEIT'S FROSTION 6.017 HEIT SECONE "18100,000 SSIFLOT 1,810RANTO M.8100808 228
FR RAT TO SERSTORE SERVENTIONSO(1)+9513FDR D-1 TO BIRERD DIMETT CIE(6)+961
                                                                                                                             -1:0(A)-8:1(A)-8:0(A)-(BND(1))8,5)-19:NEXT A:X-19:Y-22:R-32:00TD 398
                                                      FOR C=1 TO 38:NEXT C:RETURN
FOR F=1 TO F:IF D(F)=X+2 AND E(F)=Y+1 THEN 982
                                                      NEXT F 1 (F) +0 THEN 480 SOURCE CHH-1FELDT X FIFDE 8+1 TO DOINEXT B SOURCE 3.50+10.10+0.000 CHH-1FELDT X FIFDE 8+1 TO DOINEXT B SOURCE CHH-1FELDT X FIFDE 8+1 TO DOINEXT B SOURCE 3.10+3.5.10 CHH 5.10 CH
```



BANDSUZE

Some aliens just don't care. They'll hurl themselves out of their spaceships and hurtle down at you with no regard for life or limb. They smash into the ground and explode violently sending earthquake strength shockwaves rumbling out around them.

You have to dodge the explosions and at the same time destroy aliens by catching them as they drop from their mothership in a continuous stream

You can send the ugly aliens back

where they came from if you manage to destroy enough of them. But if you fail the mothership will land and colonise your planet.

You have three lives to do battle with the aliens and the explosions generated by the falling hoardes increases proportionally with the level of difficulty you choose.

Your base is controlled by using the 'Z' key to move left and '?' to move right.

Can you save the earth! Ooops, there goes another one . . .

RUNS ON A 40 COLUMN PET IN 66

anton Genie I and II accessories



The EG 3085 is quiet, fast and efficient Printspeed is 100 characters per second and printing is bi-directional at 80 or 136 characters per line. Suitable for use with other systems, it has three typestyles, adjustable pin or friction feed and single sheet or roll paper facilities. £425 plus VAT

If you don't want to pay that much for a printer, consider the EG 603. It doesn't match the EG 3085 in certain areas, but you will still get 100 c.p.s. bi-directional, a range of character styles, forward and reverse feed and pin/friction feed, with 96 £235 plus VAT



MONITORS

Available in 9" and 12" sizes, with white green or amber display, Lowe A.V.T. monitors are sturdy, attractive, easy to operate and feature an easy view screen with smoked anti-glare display filter. Compatible with most popular micros on the market From £75 plus VAT.

EQUIPMENT COVERS

Beat the dirt, coffee spills and sticky fingers when your computer and monitor are not in use with these top quality black leather covers

Genie CV1 £5 plus VAT. 12" monitors CV6 £6.20 plus VAT. monitors CV3 £4.20 plus VAT.



If you want fast, reliable program storage, true random access file handling and access to many computer languages, we can meet your needs. The EG 400T provides storage of up to 184320 bytes per floppy disk and comes complete and tested, in a stylish colour matched cobinet £220 plus VAT.

The EG 401 AT offers dual disk drive with 368640 hytes of useable storage and comes complete with a power supply ready to connect to an expander box

£365 plus VAT DOUBLE DENSITY ADAPTOR Allows the use of standard minidisk drives in double density, with virtually double the storage capacity. The EG 3021 is equally at home in the Genie or TRS-80

expander boxes A double density disk operating system will be needed, such as small_DOS



EXPANDER BOX

The undated EG 3014 expander box allows for up to four disk drives with optional double density. It connects to a printer, or RS 232 interface, or S100 cards. Not bad value at £190 plus VAT (16K version) or £200 plus VAT (32K transion) *The EG 3014 will work with TRS 80

by using the EG 3023 Tandy Adaptor. TECHNICAL MANUALS Full technical details of Genie Hardware

(all you ever wanted to know about Genie I/II Technical Manual

£10 - No VAT. essories (EG3014) £10 - No VAT.

small DOS

Powerful, yet reasonably priced, the commands, 7 utilities, LBASIC, disk basic and bags of information, including a reference manual and 40 page be guide to disk usage. £35 plus VAT.



HIGH RESOLUTION

Increase graphic resolution capabilities on your Genie seventy-turee and the LE18 HI-RES unit. It offers bit image our Genie seventy-three fold with the graphics of 73,728 points, a resolution of 384 x 192, and uses a separate 16K of video memory to achieve its resolution. Graphics are intermixable with text or existing pixtel graphics, and animation. reverse video displays and use of programmable graphic characters are possible. £86 plus VAT.



GENTE MONTTORS

£79 plus VAT.

Two good performance, low priced 12" monitors, either to match your Genie or compatible with a wide range of other systems. Good resolution and band width and, of course, they free your television set for the other type of programmes you like to watch!

The EG 100 12" in black & white costs £69 plus VAT.
The EG 101 12" with green phospher is

BUSINESS SOFTWARE

Specifically written for the Genie II computer with disks and a suite of packages from the renowned hous TRIDATA. The suite includes SALES LEDGER PURCHASE LEDGER PAYROLL and STOCK CONTROL package is a very reasonable £175

plus VAT. Full details are available on



SYSTEMS DESK

Even a compact modular con system like the Genie benefits from being used on a custom designed system desk The SD-1 system desk is designed to accommodate a complete Genie System and has a special upper shelf to support the display monitor at the best level. The desk is flat packed for easy delivery and finished in attractive teak and charcoal

colours. £81.40 plus VAT. FRED MUSIC SYNTHESISER Beethoven might well roll over at this stereo music synthesiser, it can produce

six simultaneous notes over the whole radio range and provide sound effects. FRED comes complete with a software compiler, full instructions and a demo

It is simply plugged onto the Genie 50 way bus and has two outputs for an audio amplifier. £51 plus VAT.



EG 3203 TANDY-BASHERI

If you are a TANDY user, read on! The EG 3203 is bus converted to allow Geni peripherals to be used with Tandy Model computers. £18.40 plus VAT. (lust in case there might be a few strange

souls who want to convert in the opposite direction, there is the 50/40 converter which generates a Tandy compatible 40 way bus from a Genie.) £34 plus VAT.

EG-3016 PARALLEL PRINTER INTERFACE

The EG 3016 is a simpler interface allowing a Centronics parallel ompatible printer (EG 603, EG 3085) to be connected directly to the Genie keyboard without the need for an expander box. £38 plus VAT.



A most useful accessory, allows two bus using devices to be connected simultaneously to the Genie - when using he Hi Res and expander for instance. £21 plus VAT.

EP1, EP2, EP3

Genie I and Genie II have ROMS offering 13.5K Microsoft BASIC, of which the final 1.5K BASIC are austom war extensions contained in EPROMs. You can change these as follows:

Adds all Genie 1 software facilities to other Genies, lower case driver, machine language monitor, renumber facility. keyboard repeat and screen print.

Has improved M.L. monitor, can load and save programs. Defined function keys (list. load, save etc.) for Genie II and lower case driver

Has HI-RES driver software with 10 extra HI-RES commands which prevent need to load HI-RES software from tape.

All at £12 plus VAT

For Video Genie Systems, the LE-19 connects direct to the Genie bus and allows one of these EPROMs to be fitted externally. £26.50 plus VAT.



NEW! A 64K CP/M computer for less than £1,000!

CP/Genie with single disk drive has 64K RAM, 13.5K ROM, comes complete with a 12" monitor, 64 x 16 screen format and operates under CP/M 22 supplied with machine, £999 plus VAT. The dual disk version will cost £1,175

plus VAT Both are compatible with existing Genie I software and are supplied with the Genie SmalLDOS. A breakthrough for Lowe Electronics customers that should

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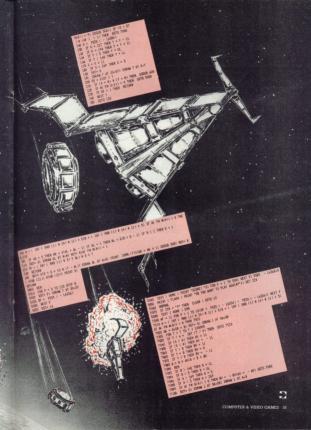
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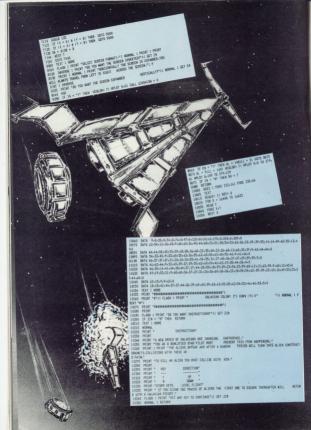
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Are you ready for

until eventually you are not fast enough anymore.

131

It is totally diffe arcade type game for the action is in two entirely different sections of the so real arcade game of the same name

And it is fast, very fast. The speed of both the bombs dropping and your own firing requires quick responses indeed The aim is to protect your two bases in the middle of the screen from guerrilla attacks. This is hard, for they come at you from both sides of the screen at the same time, knocking out and removing your defences util they get the ba You defend by firing at the guerrillas as they attack. Not so easy though for they rain down bombs whist moving Too detects of rining at the guerrian as very discovered and a second of the second of

whilst you may be busy tracking one ambling across, another will suddendly zip away at your defences. For once and for all the problem of levels of play has been solved. Cosmic Guerrillas simply gets harder and harder Sound of course

A sensible £9.50 Vat and post paid

Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield, S44 5XF, Tel. 0246 850357

CKP

When I was very young I used to take great delight in bashing bricks all over: the place - but after hitting myself on the head with the wrong end of a claw;

hammer I decided to stop. But now I can pursue old habits without putting myself

in any danger thanks to my VIC-20!" So says Shaun Southern, author of this fast moving program.

At the bottom of the screen produced by your VIC you will see a demon bricklayer, cementing bricks as fast as he

can. In fact he gets faster all the time. The rows of bricks will rapidly fill the screen unless you can halt his progress You are in control of a small craft at

the top of the screen which whizzes back and forth almost as fast as the bricklayer. You have to drop bombs on the wall to knock holes in it - it's as

simple as that! The bombs are fired by using the f7 key - the only control in the. game.

Shaun has provided some tips

on getting a high Score. His is 218. He advises you to aim for the cracks in the wall as this scores more points. The ends of the wall should

be cleared first as this is a difficult thing to do later in the game.

20

The game ends when your craft collides with a brick and your score and the highest score will be displayed. So if you don't feel like becoming other brick in the wall - get blasting!

REM *** INITIALISATION ***

POKE36878, 15:S1=36876:S2=36877:DIMO(#(1) REM *** RESET VARIABLES ***

GOSUB46:POKE36879,93:P1=7680:P2=1:SC=0:X2=-1:X3=0:ZZ=0 PRINTCHR\$(142)"##########;:FORX4=1T05:PRINTXX\$(0):PRINTXX\$(1):NEXT

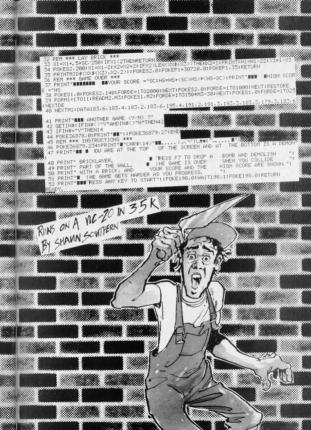
GOSUB30: IFZZ=1THEN37

PEM *** CONTROL ROUTINNE *** POKES1,200:GOSUB33:FORDE=1T020:NEXTDE:POKES1,0:GETINs:IFINs<>CHR\$<136>T

REM *** FIRE MISSILE *** FORH1=P1+22T08185STEP22: IFPEEK(H1)<>32THEN24 POKEH1+30720,0:POKEH1,93:POKES1,200+2*(INT(H1-

GOSUB33: POKES1, 0: POKEH1, 32: NEXTH1: GOTO17 REM *** REMOUE BRICKS *** H2=(PEEK(H1)=227)-(PEEK(H1)=207):POKEH1,32:POKEH1+H H1=H1-22:F0RH3=1T021:H4=H1+H2*H3:IFPEEK(H4)= POKEH4,32:POKEH4+H2,32:POKES1,250-3*H3:SC=SC+13*H1=H1-22:GOSUB30:IFZZ=1THEN37

GOSUB33: POKES1. 0: NEXTH3: POKE198, 0:0 REM *** MOVE PLAYER *** P2=P2+(2*P2*(P1+P2<76800RP1+P2>7700)):IFFEE





More puzzling than that Cube, more colourful than a trip into hyperspace - that's the Hungarian Squares!

On your screen appear two multicoloured squares. Look carefully and you'll see that each of the two large squares is made up of several smaller coloured squares. The idea of the game is to manipulate the smaller squares to create two big squares of alternating colours. Or you can simply create your own patterns - which might just be easier!

The program is fairly simple, making use of CALL GCHAR and CALL HCHAR, which are the TI equivalent of PEEKING and POKING the screen display, respectively. The screen is 32 columns wide and 24 lines deep. CALL GCHAR and CALL

(ROW, COLUMN, NUMERIC VARIABLE) where the numeric variable is the ASCI code of the character. CALL KEY is the equivalent of INKEY or GET- CALL

KEY(O,A,B) will return the ASCI value of the key pressed to variable A. B is 0 if no key is pressed.

CALL CHAR defines the characters and CALL COLOR their colours. Numeric arrays are used to hold the screen position of each of the small squares - numbered from 1 to 20 from the top left corner of each large square and counting clockwise. This program occupies under 4k of memory, but requires

4.8k to operate in. Those arrays take up a little room.

EXAS INSTRUMENTS

CHAR (128, "FF80BE8888B88 CHOR(129, "017D417D057D0

DIM RA(20), CA(20), RB(20), CB(

COLOR (12,2,6)
COLOR (13,2,13)
COLOR (14,5,14)
F ":"(C) STEPHEN SHAW
A MANIPULATIVE PUZZLE"
F ":"PRESS ANY KEY GOTO 1500 CALL HCHAR (22, 31, 30) CALL HCHAR (22, 31, 30) CALL HCHAR (22, 31, 33) CALL HCHAR (23, 31, 33) CALL HCHAR (33, 31, 32) CALL HCHAR (33, 31, 32) CALL HCHAR (34, 32, 32, 32) FOR C=1 TO 19 CALL GCHAR(RA(C+1), CA(C+1), 500 CELLY TERM LARGE SOURCE SOURCE SALE ARE TO SOURCE STORY SOURCE STORY SOURCE STORY SOURCE CALL HCHAR (RA (C+1), CA (C+1), TEN SMALL TEMPA=TEMPB NEXT C CALL HCHAR(GOTO 1500 REM MOVE A ANTICLOCKWISE THE COL CALL GCHAR (RA(20), CA(20), TE FORMING THE OF ALTERNATE FOR C=19 TO 1 STEP -1 CALL GCHAR (RA (C), CA (C), TEMP TRY TO COLL HCHAR (RAIC) - CAIC) - TEMP ONV KEY TO TOO PRINT """PPEES ANY 1 TO THE STATE OF THE NEXT C CALL HCHAR (RA(20), CA(20), TE GOTT 1500 (22.31.30)
GALL HORRIST 1530
GALL GALRIST 1530
GALLIST 1530
GALLIST 1530
GALRIST 1530
GA FOR C=1 TO 19 CALL GCHAR(RB(C+1),CB(C+1), ALL HCHAR (RB(C+1), CB(C+1), TEMPA=TEMPB NEXT C CALL HCHAR (RB(1),CB(1),TEMP GOTO REM KWISE CALL C=1 TD 7 HCHAR (RA(C), CA(C), 96) HCHAR (RB(C), CB(C), 104) MOVE B ANTI-CALL HCHAR(RB(C)) CB(S), 112)
REXT C
CALL HCHAR(RB(S), CB(S), 112)
FOR C=9 TD 147
FOR C=9 TD 177
FOR C=9 TD 177 GCHAR (RB (20) , CB (20) , TE FOR C=19 TO 1 STEP -1 GCHAR (RB(C), CB(C), TEMP CALL HCHAR (RB(C), CB(C), 96) CALL HCHAR (RB(C), CB(C), 104) CALL HCHAR (RB(C), CB(C), 104) CALL HCHAR (RB(C), CB(C), 104) CALL HCHAR (RB(C), CB(C), TEMP TEMPA=TEMPB NEXT C CALL HCHAR (RB(20), CB(20), TE GOTO 1500 END REM (C)11 REM BY S REM 10 A CALL HCHAR(3,5,ASC("A")) HCHAR(13,17,ASC("B")) ACTUAL MOVEMENT ACTUAL MOVEMENT (C)1982 BY STEPHEN 10 ALSTONE STOCKPORT COMPLETER & VIDEO CAMPS 87



DEFENDER

Can you defend the inhabitants of an alpine planet from destruction at the hands of alien kidnappers?

In Sharp Defender you are at the controls of a spacecraft flying across mountainous terrain with a mission of protection ahead of

vou. The aliens enter from the right, firing and dropping bombs to try and pick off their prey from one of the mountain peaks.

on the radar screen and try to dodge their fire and pick the kidnappers off before they can get alien claws into human flesh.

Your task is made more difficult by the antics of the planet's inhabitants, who seem to come from mountaineering stock and climb the peaks regardless of the peril they put themselves in.

If an alien lander reaches his prey or manages to hit your ship, en you lose a life. After thre

lives the game is over.

Basil Zimmo has produced a very neat graphical representation of the popular arcade game

and although it is written in Basic it still proves difficult to excel at. There are several good presentation touches and the game comes complete with a range of sound effects.

The control keys are: W= up; X= down; A= left; D= right; S= five: H= hyper

```
You can judge their ann
             SHARP DEFENDER
       ERISE(1)
             Written for C&U games
       = 47
 REM
       8-
             MAY 1982
             BY BASIL ZIMMO
       121211
6 REM
16 REM "B"=CLEAR SCREEN. "B"=CURSOR HOME, "B"=CURSOR DOWN, "B"=CURSOR UP
   PRINT"E"; TAB(13); "D E F E N D E R"
PRINTTAB(13); "
30 PRINT'S YOU ARE IN COMMAND OF A DEFENDER SHIP."
35 PRINT YOUR MISSION IS TO DEFEND THE MEN ON THE";
40 PRINT MOUNTAINS. IF A MAN IS KILLED OR YOUR SHIP IS HIT THEN YOU LOSE";
45 PRINT" DNE SHIP, GAMEIS OUER WHEN ALL 3 SHIPS ARE LOST."
50 PRINT"88 CONTROLS ARE:
55 PRINT" W = UP
56 PRINT" X = DOWN
 57 PRINT" A = LEFT
 58 PRINT" D = RIGHT
 59 PRINT" S = FIRE
 90 REM ABCDEFGHIJKLMNOPORSTUMMYZ1234567890! ##$%& ( )#+-*=£1 . / 2 ?\[] >@(#**# ( )#+
 100 K$=CHR$(99);M$="
                                                                              "+K$+"/
```

\"+K\$+" "+K\$+"

110 Ms=Ms+" "+Ks+"/ \ \"+Ks+"



```
"+K$
   M$=M$+" [
                      7 "+K$+"~
                                          \"+K$+
   M#=M#+"/
140 DIMM$(40): A$="BPLEASE WAIT WHILE A NEW GAME IS PREPARED"
145 REM * PREPARE MOUNTAINS *
150 FORX=1T040
155 PRINTMID#(A#.X.1):
170 Ds=Ds+MIDs(Ms, I+2, 39)+MIDs(Ms, I+1, 1)
180 NEXTI: M$(X)=D$: M$=D$: D$="": NEXTX
                     PRESS ANY KEY
181 PRINT"
182 GETA$: IFA$=""THEN182
185 N=3:S=0
190 SY=4466: SX=4465: SC=53248: Z=0: AL=206: MA=202: SP=64: TEMP07
200 DX=11:DY=INT(RND(1)*9)+9
210 DIMA(4,2),S(4),T(4),E(15,15):PRINT"E":D$=""
215 REM * RANDOM POSITION FOR ALIENS *
230 A(1,1)=INT(RND(1)*15)+62:A(1,2)=INT(RND(1)*11)+2:NEXT
240 H=0:MT=1:GOSUB5000:XD=DX:VD=DV
1000 GOSUB5100: D#="4- ": GOSUB2000: GOSUB1920
1030 GOSUB5100: R=1: GOSUB1500: R=0: IFH=1THEN4000
1499 REM * MOUE DEFENDER *
1500 POKE17828, 0: GETK$: IFK$=""THENRETURN
1520 K=1*(K$="W")+1*(K$="X")+1*(K$="A")+1*(K$="D")+1*(K$="H")+1*(K$="S")
1550 IFK$="W"THEN1600
1560 IFK$="X"THEN1650
1570 IFK$="A"THEN1700
1590 IFK#="S"THEN1800
1600 DY=DY-1: IFDY(8THENDY=8:60T01910
1610 P=SC+DX+DY*40:FORI=PTOP+3:IF(PEEK(I)=206)+(PEEK(I)=46)THENH=1
1620 NEXTI: GOTO1900
1650 DY=DY+1: IFDY>21THENDY=21: GOT01930
1660 GOTO1610
1700 DX=DX-1: IFDX<11THENDX=11:G0T01910
1710 IF(PEEK(SC+DX+DY*40)=46)+(PEEK(SC+DX+DY*40)=206)THENH=1
1760 IF(PEEK(SC+DX+4+DY*40)=46)+(PEEK(SC+DX+4+DY*40)=206)THENH=1
1770 GOTO1900
1800 MUSIC"_A0"
1810 A=0:P=SC+DX+4+DY*40:FORI=PTOP+34-DX:J=I:IFPEEK(I)=ALTHENA=1:I=P+39-DX
1815 IFPEEK(I)=46THENI=P+39-DX:REM DISPLAY CODE 46 = "."
```

1820 POKEJ, 124: NEXTI

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```
1880 GOTO1910
1905 IF(K$="A")+(k$="0")THEN1915
1910 FORI=0T03:RESETXD+15+1, VD-6+1:RESETDX+15+1, VD-6-1:RESETXD+15+1, VD-6:NEXT
1915 IFYD=8THENPRINT"D": TAB(13):"-
1916 IFYD>18THENPOKESY, 7: POKESK, 13: PRINT "
                                                             ": IFYD>19THEN1930
1920 RESETXD+15, VD-6; RESETXD+18, VD-6
1925 FOR L # 0T03: SETDX+15+1.DV-6: NEX3
1940 RETURN
1999 REM * DISPLAY DEFENDER *
2000 FORI =- 10TO-1: POKESX, DX+I: POKESY, DY: PRINT" 4"
2010 POKESY, DY: POKESX, DX+13-(11+1): PRINT"_ ": MUSIC"_C3": NEXTI
2030 POKESX, DX+1:POKESY, DV+I-1:PRINT" ":POKESX, DX+1:POKESY, DV+I:PRINT"="
2070 NEXTI
2090 REM * MOVE ALIENS *
2110 A(I,1)=A(I,1)-1:IF(A(I,1))26)*(A(I,1)(55)THEN2200
2115 IFA(I,1)<3THENA(I,1)=75
2120 IF A(I,1)=26THENPOKESC+12+(A(I,2)+6)*40,0
2125 IF(S(I)<>0)*(PEEK(S(I))<>46)THENS(I)=0
2130 SETA(I,1),A(I,2)
2140 NEXTI: RETURN
2200 IFA(I,1)=54THENPOKESC+39+(A(I,2)+6)*40,AL:GOTO2130
2220 H=1:GOTO2130
2230 IF(S(I)<>0)*(PEEK(S(I))=0)THENS(I)=0
  31 POKEP+1,0:POKEP,AL:GOSUB2500:IF(S(I)=0)*(RND(1)<.6)THEN2130
2234 IFA(I,1)<27THEN2130
2235 IFS(I)=0THENS(I)=P-1:MUSIC"_#F1"
2250 IF(B-P)(0THENB=B+39:60T02280
      IF(B-P)(30THENB=B-1:G0T02280
2280 IFPEEK(B)=64THENS(I)=0:J=3:B=0
 290 IFH=1THENJ=3
 300 POKEC, 0: NEXT: POKEB, 46: S(I)=B: GOTO2130: REM DISPLAY CODE 46 =
2410 GOTO2130
```



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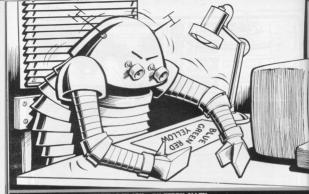
5140 T(I)=-1:NEXT

5160 FORI=1T04: IFT(I)=0THENNEXT: RETURN 5170 POKESC+A(I,1)-15+(A(I,2)+6)*40,206: NEXT: RETURN



```
2540 J=SC+A(I,1)+825
550 IEPEEK (J) () MATHENRETURN
2560 IF(P-I)=0THENH=1:7=1
2570 A(I,2)=A(I,2)+1
2600 POKEP, 0
2605 P=SC+A(I,1)-15+(A(I,2)+6)*40: J=SC+DX+DY*40
2620 IFPEEK(P)=ALTHENA(1,2)=A(1,2)+1:G0T02605
4000 REM * HIT *
4010 H=0: A$="YOUR SHIP WAS HIT": IFZ=1THENA$="A MAN WAS KILLED"
4020 X=DX*2+2:Y=DY*2:RESTORE
4025 PRINT"0888":TAB(12):A$:FORI=1T01000:NEXT
4030 FORI=1T040
4931 REM * SOUND *
4045 IF (Y-B(0) THENNEXT: 60T04070
4050 IFA/2=INT(A/2)THENSETX+A, Y+B:SETX-A, Y-B:E(A,B)=-1:NEXT:GOTO4070
4060 SETX+A, Y-B:SETX-A, Y+B:E(A, B)=1:NEXT
4979 MUSIC"Z"
4075 FORI=15T00STEP-1:FORJ=0T015
4080 IFE(I, J)=-1THENRESETX+I, Y+J:RESETX-I, Y-J:E(I, J)=0:60T04100
4100 NEXTJ, I: PRINT" ": N=N-1: IFN=0THEN4500
4110 FORI=1T01000: NEXT: G0T0190
4510 PRINTIAB(10): "ANOTHER GAME?"
4520 GETA$: IFA$=""THEN4520
4530 IFA#="Y"THEN185
4540 IFA$="N"THENPRINT"E":END
4999 REM * DISPLAY RADAR *
5000 PRINT"E
5010 FORY=1T06: POKESY, V: POKESX, 0: PRINT" | ": POKESY, V: POKESX, 39: PRINT" | ": NEXT
5020 PRINT"8-
5030 FORI=SC+320TOSC+720STEP40: POKEI, 64: NEXT
5060 PRINT"SCORE:
                          HIGH:
5090 RETURN
5100 MT=MT+1
5120 IF(A(I,2))12)*(PEEK(SC+A(I,1)-15+(A(I,2)+6)*40)=206)THEN5140
5130 NEXT: G0T05150
```

5150 POKESY, 19: POKESX, 0: PRINTM\$(MT):: POKESX, DX: POKESY, DY: PRINTD\$



RUNS ON A BBC MODEL A IN 16K BY TERRY ALLEN

There's a rainbow hidden inside your BBC micro — can you crack the code and bring a little colour to its circuits?

The computer selects four colours from a choice of six — red, green, yellow, blue, magenta and cyan — and hides them in four locations. You have to guess what four colours the computer has chosen and in what order they are held.

You get sight attempts to solve the puzzle. Each time you make an attempt the computer will toll you how many of the colours you have got right and how many you have placed in the correct position. As you may have already guessed this game is similar to that famous board oame Mastermind.

game Mastermina.

The computer's choice will be revealed at the end of each game. Instructions on which keys to use are included in the program.

Will you be able to find you way over the rainbow?

```
2 REM * Listing courtesy of *
   3 REM * Microage Electronics
   4 REM ******************
  10CLS: Y=0: GOT090
  20DEEPROCCOLOUR
  30FDRW=OTD5:FDRZ=OTD3
  40PRINTTAB(0, Z*6+W); CHR$(134-Z-Y); CHR$157
  60FDRV=1TD200: NEXT V: NEXTW
   70Y=Y+1: IF Y=3 THENY=0
  POENDERDE
  90PROCCOLOUR
  100PRINTTAB(13,8);CHR$151;CHR$141;"F 0 U R";TAB(13,9);CHR$151;CHR$141;"F 0 U R
  110PRINTTAB(10, 14); CHR$151; CHR$141; "C 0 L 0 U R S"; TAB(10, 15); CHR$151; CHR$141;
"COLOURS"
  120FDRU=1TD3000: NEXT
  130PROCCOLOUR
  140PRINTTAB(13,8);SPC(7);TAB(13,9);SPC(7);TAB(10,14);SPC(13);TAB(10,15);SPC(13
  150PRINTTAB(7,9); CHR$135; "Do you want instructions?"
  160PRINTTAB(4,14); CHR$132; "Type 'Y' for YES or 'N' for NO"
  170Q$=GET$
```



1801F D4="Y" THEN210 190IF Q#="N" THEN720 200G0T0170

210CLS

220PRINTTAB(2.3): "The computer selects four colours": TAB(2.5): "from these six:

230PRINTTAB(12,7); CHR\$129; "Red"; TAB(22,7) CHR\$145; CHR\$255 240PRINTTAB(12,9);CHR\$130; "Green";TAB(22,9);CHR\$146;CHR\$255 250PRINTTAB(12, 11); CHR\$131; "Yellow"; TAB(22, 11); CHR\$147; CHR\$255 260PRINTTAB(12, 13); CHR\$132; "Blue"; TAB(22, 13); CHR\$148; CHR\$255 270PRINTTAB(12, 15); CHR\$133; "Magenta"; TAB(22, 15); CHR\$149; CHR\$255 280PRINTTAB(12, 17); CHR\$134; "Cyan"; TAB(22, 17); CHR\$150; CHR\$255 290PRINTTAB(1.19); "It holds them hidden in four positions" 300PRINTTAB(6, 24); "Press any key for next page";

310R\$=GET\$ 320PROCCOLOUR

330PRINTTAB(2,3) (SPC(33) 340PRINTTAB(2,5);CHR\$135; "You have to guess which colours and 350PRINTTAB(2,7);CHR\$132; "in which order they are held." 360PRINTTAB(2.9) | CHR\$132; "You can make up to eight attempts." 370PRINTTAB(2,11) (CHR\$132) "Each attempt is marked to show how" 380PRINTTAB(2,13);CHR\$135; "many are of the correct colour and" 390PRINTTAB(2,15); CHR\$135; "how many are also in the correct" 400PRINTTAB(2, 17) [CHR\$135; "position." [SPC(12)

410PRINTTAB(2, 19) (SPC(38) 420S\$=GET\$

430CLS

440PRINTTAB(2,1); "To choose your colours press the" 450PRINTTAB(2,3); "number keys 1 to 6. They will print"
460PRINTTAB(2,5); "coloured blocks as shown below: "

470PRINTTAB(5,7); CHR\$129; "Key 1 Red"; TAB(21,7); CHR\$145; CHR\$255 480PRINTTAB (5,9) | CHR\$130| "Key 2 Breen" | TAB (21,9) | CHR\$146| CHR\$255 490PRINTTAB(5,11); CHR\$131; "Key 3 Yellow"; TAB(21,11); CHR\$147; CHR\$255

500PRINTTAB(5, 13); CHR\$132; "Key 4 Blue"; TAB(21, 13); CHR\$148; CHR\$255 Magenta"; TAB (21, 15); CHR\$149; CHR\$255 510PRINTTAB(5, 15); CHR\$133; "Key 5 520PRINTTAB(5, 17); CHR\$134; "Key 6 Cyan"; TAB(21, 17); CHR\$150; CHR\$255 530PRINTTAB(2, 19); "The above code will be repeated at"

540PRINTTAB(2,21); "the foot of the playing page." 550PRINTTAB(6,24); "Press any key for the next page";

560T\$=GET\$

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```
580PRINTTAB(2,1); SPC(32)
  590PRINTTAB(2.3);CHR$132;"The computer's choice will be
  600PRINTTAB(2,5);CHR$132; "revealed at the end of each game."
610PRINTTAB(2,7);CHR$135; "Don't forget you have only eight"
  620PRINTTAB(2,9); CHR$135; "attempts."; SPC(12)
  630PRINTTAB(2,11);CHR$135;"If you would like to read the"
  640PRINTTAB(2,13); CHR$135; "instructions again press 'Y'."
  660PRINTTAB(2,17);CHR#135;"Will start.";SPC(10)
  670PRINTTAB(2, 19) ISPC(34) ITAB(2, 21) ISPC(33) ITAB(2, 23) ISPC(20) ITAB(6, 24) ISPC(31
):
  680U$=GET$
  690IF US="Y" THEN Y=2:80TD210
  7001F US="N" THEN720
  710B0T0680
  720CL SEPRINT
                                     No. correct in-"
  730PRINT" Attempt
                         Colours
  740PRINTTAB(4); "No. "; TAB(13); "Chosen"; TAB(24); "colour position";
  750PRINTTAB(7,19); "Press the number keys for"
  760PRINTTAB(7): "the colours you choose as"
  770PRINTTAB(7); "shown below:-"
  780PRINTTAB(6);CHR$129;"1 RED";CHR$130;" 2 GREEN";CHR$131;" 3 YELLOW"
  790PRINTTAB(6) ICHR$132; "4 BLUE"ICHR$133; " 5 MAGENTA"ICHR$134; " 6 CYAN"
  800A=RND(6):B=RND(6):C=RND(6):D=RND(6)
  BIOFORF=1TOB
  820G=0:H=0: I=A:J=B:K=C:L=D
  BROKOR METTOA
  840IF M=1 THENPRINTTAB (4.1+F+2) IFI
  850N#=GET#: N=VAL (N#)
  860IF N=0 DR N>6 THEN1250
  870PRINTTAB(10+2+M, 1+F+2) (CHR$(128+N) (CHR$255)
  880IF N=A AND M=1 THEN H=H+1:80T0920
  R90IF N=R AND M=2 THEN H=H+1:80T0920
  900IF N=C AND M=3 THEN H=H+1:B0T0920
  910IF N=D AND M=4 THEN H=H+1
  920IF N=I THEN G=G+1: I=0: G0T0960
  930IF N=J THEN B=G+1:J=0:BDTD960
  940IF N=K THEN G=G+1:K=0:GDTD960
  950IF N=L THEN B=G+1:L=0
  960NEXT M
  970PRINTTAB(26, 1+F+2) (CHR$135(G) TAB(35, 1+F+2)(H
  9801F Hm4 THEN1010
  990IF F=8 THEN1110
 1000NEXT F
 1010FOR 0=0T04
 1020PRINTTAB (7, 19+0) | SPC (25) : NEXT 0
 1030DN F GOTO 1040, 1050, 1060, 1060, 1070, 1070, 1080, 1080
 1040PRINTTAB(13, 19); "Dead lucky!!": GOTO1150
 1050PRINTTAB(6, 19); "Lucky! "; : GOTO1090
 1060PRINTTAB(3,19); "Excellent. ";:80T01090
 1070PRINTTAB(3,19); "Very good. ";:80T01090
 1080PRINTTAB (7, 19); "Good. ";
 1090PRINT"Success at attempt No. ";F
 1100G0T01150
 1110FOR 0=0TO4
 1120PRINTTAB (7, 19+0) ; SPC (25) : NEXT 0
 1130PRINTTAB(0,19); "Hard luck. no success after 8 attempts."
 1140G0T01150
 1150PRINTTAB(12,20)CHR$(128+A);CHR$(255;CHR$(128+B);CHR$(255;CHR$(128+C);CHR$255;
CHR$ (128+D) ( CHR$255
 1160PRINTTAB(2); "The computer's choice is shown above."
 1170FDR U=1TD3000:NEXT
 1180PRINT"Do you want to play again? Type Y or N"
 1190P$=BFT$
 1200IF P$="Y" THEN720
 1210IF P#="N" THEN1230
 1220G0T01190
 1230PRINT: PRINTTAB(10); "Thankyou. Goodbye
 1240END
 1250PRINTTAB(9, VPOS+1); CHR$136; "Wrong key try again"
 1240FDR T=1TD5000:NEXT
 1270PRINTTAB(10, VPOS-1); SPC(21)
 1280G0T0850
```

Adventure

FLAWED MASTER-WORK

You have written your masterpiece, and the first Adventurer to receive his cassette from your software house starts to play. Eventually he is confronted by a problem which you consider to be one of your more brilliant touches! Until he types in the necessary sequence of commands, he can go no further.

What you assumed was an obvious solution given some thought, is too obscure for your player and he is now hopelessly stuck. What is worse, he is becoming bored and about to tell all his fellow Adventurers so. How can you, the author, avoid this?

Ask some friends round to have a go at your Adventure while you are still writing it. Not everyone has a mind bent towards the kind of thinking needed to play Adventure, so you must select you guinea pigs carefully!

Invite them one at a time as you will want to see how they react individually. Sit with them and make a note of each problem with which they have unreasonable difficulty. Now you can decide where extra clues are needed.

The most direct way to introduce

these is for each clue to be a response to the word HELP. Let us look at an imaginary example. Consider the garden in which last

month we grew a beanstalk. The garden was location not, a spade, bean and bucket were objects 5, 9, and 12 respectively. If the bucket is empty the flag C(12) will be 2. Figure 1 shows a series of possible steps in the player's logic, and a suggested response from the computer to the command HELP. If control passes to — saw — line

4000 when HELP has been decoded by the reply decoding routine, then: 4000 ON LN GOTO 4100,4200,4300, 4400,4500

will access a different HELP routine for each location. (Each problem will be location dependent.)

Here the location is 4, so control

will pass to line 4400.

4400 IF C(5) = 2 THEN LET Q1\$ = "NEEDS DIGGING": GOTO 100

"NEEDS DIGGING": GOTO 100
Arranging for C(5) to be increased to 3 when a hole is dug, we

4410 IF C(5)=3 THEN LET Q1\$="HOLE IS BEAN-SIZED":GO-TO 100 4411 REM GOODNESS! HASN'T HE

FOUND THE BEAN YET?
As C(5) is again increased by 1 when the bean is planted, we can

when the bean is planted, we can use this fact not only in the PLANT routine, but also for HELP: 4420 IF C(5)=4 THEN LET Q1\$="GROUND IS VERY DRY": GOTO 100

4421 REM YES — IT WILL NEED

EH

WATERING! WHEN DONE C(5)=5 4430 IF C(5)=5 THEN LET Q1\$= "SOMETHING AT THE TOP": GOTO

4431 REM CLIMB IT FOR HEAVEN'S SAKE! 4440 LET O1\$ = "SORRY I CAN'T":

GOTO 100
C(5) will be increased to 6, and therefore this line will execute by default when the beanstalk is chop-

ped down later.

Finally, all the IF statements can be avoided by the use of ON . . GO-

TO: 4400 ON C(5)-1 GOTO 4105,4410, 4420,4430,4440

4420,4430,4440 4405 LET Q1\$ = "NEEDS DIGGING": GOTO 100 . . . etc.

GURE 1 PLAYER'S ACTION	PLAYER THINKS	REPLY TO HELP
Arrives in garden	Oh! A garden! What do I do?	Needs digging
Finds spade, goes into garden, digs	Hello! a hole! What use is it?	Hole is bean-sized
3 months later, finds bean & plants it in hole	How disappointing Only a beanshoot	Ground is very dry
3 months later, finds water &	What on earth can I do with a huge	Something at the top

beanstalk?

The date is April 2nd 1913. A telephone in your Scotland Yard office rings. "Inspector Strade here. There's been a murder at Crowley Manor." So the mystery starts.

hucket, waters

heanshoot

By two word commands you find yourself on the street, there's no alternative. You seem powerless but to follow the plot. A hansom cab pulls up. The driver smiles at you. Nothing to worry about, he is just trying to lure you to take his cab to Crowley Manor.

Now I'm the awkward type and

did everything I could to avoid using that cab. But eventually I had to let events overtake me.

I was convinced that the game

was going to solve itself, but it was not to be.

After stumbling over a body and

slipping on something slimy, I found the game became quite difficult — mainly due to the inconsistency of the form of the commands recognised.

The worst offender was a hole I

wished to traverse. After I gave up, Neil, my 14 year old son tried out his American on it — CLIMB THRU HOLE — and succeeded! I was so frustrated I left him to solve the mystard.

The Curse of Crowley Manor runs on a TRS-80 and Video Genie in 16k, and is obtainable from Calisto Computers.

Savage Island Part Two starts where Part One left off, and for me doesn't go much further — yet! A neon sign proclaims: "Part 1 will seem like a piece of cake compared with what you are about to go

through!"

That sign is difficult enough to get to! Can anyone help?

Not having played Golden Voyage, Scott Adam's latest, I was unable to ofter any advice to a desperate reader who contacted me recently. Intrigued, I had a go, and would now put money on where he is stuck. Please "STEP UP"

Mr Reader and tell me if I'm right!!

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Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing

There's no need to stop there. The ZX Printer - available now - is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board



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rum



The ZX Printeravailable now

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changeable microfloppy.

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All the BASIC commands required for the Microdrives are included on the

Spectrum.
A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.





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This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

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MATHS IS ALL YOU NEED...

One aspect of computer graphics that seems to concern many of the people interested in it is the idea that it is necessary to know a good deal of mathematics.

deal of mathematics.

To see how much mathematics it is necessary to know in order to generate useful graphic displays on a microcomputer it is useful to examine the way in which the user is producing them.

In terms of the mathematics to

is producing them.
In terms of the mathematics to be used, the two extreme positions are those of the programmer who writes all his own graphics software to generate the displays he wants on his system, and that of the person who simply uses an existing frogram as a tool for making highly shall be displays he wants for his

If we examine these extremes, the writer of a graphics program must know all the mathematics necessary to achieve his effects because the mathematics must be built into the program itself.

The basic area of mathematics that is called on is, of course, geometry. Two-dimensional geometry is studied at school by most people, and is found as simple as anything in mathematics by most people simply because it can be treated in a pictorial way.

Three-dimensional geometry is usually found to be a good deal more difficult mainly because the visualisation of solid objects and shapes is not easy for most people.

Öther mathematical techniques include the calculus and matrices. Since the use of the matrix is included in all modern maths syllabuses, this is an area that is familiar to many. More sophisticated forms of geometry that are of great value are differential geometry and homogenous coordinate geometry.

The graphics programmer writes programs for the user at the other of our extremes who simply uses existing programs. Such a user needs to learn how to run a particular program: he needs only a qualitive and mathematical appreciation.

Learning to use a graphics program may not require an entirely negligible effort, but it is clearly a far simpler task than mastering the mathematics that went into the writing of the program itself.

Programs that can be used in this way have been written for applications that include generating and storing screen displays for later incorporation in other programs, such as games, and computer-aided design programs in which a graphic display enables the user to examine the results of his desim efforts.

Programs for displaying threedimensional shapes can have many uses, notably in education, but also for example, for use by architects to display models of buildings in the planning stage to their clients.

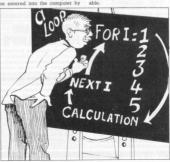
Another way to produce graphics which requires the use of no mathematicals at all is to use a graphics tablet such as is available for the Apple and Atari machines.

With such a device, shapes can be entered into the computer by tracing them on the digitising surface of the tablet or by building them up with lines in the ways provided by the menu of commands possessed by the tablet and its software.

The number of graphics input devices for microcomputers is increasing: at the recent Pet show a digitiser that is usually used with mainframe computers was shown interfaced to a Pet. Also, more graph plotters are available for micros, so that graphic results can be saved in permanent form

In between the two extremes it is necessary to be familiar with a certain amount of mathematics to amend graphics programs that do not do exactly what you want. To make the change it is necessary at least to understand the mathematics

incorporated in the relevant routine. So the answer to the application "How much mathematics do I need for graphics?" is that you need quite a lot to write your own graphics programs, that a little, at least, is needed if you need to modify graphics programs, but that none at all is needed if you are content just to use some of the many fine control to the programs of the many fine to the programs of the programs of the many fine to the programs of the progr



PRACTICAL PROGRAMMING

FAST THINKING THE QUICK WAY

When entering programming competitions like Beat the Bugs it is useful to make an early impression on the judges by giving your program a fast solution time.

This month I am looking at methods for making programs run faster. This is because I have recently bought a Spectrum and, although I am generally happy with it, it is much slower than the Com-

pukit I am used to.
Although computers can perform simple calculations with no noticeable delay, the calculations do take a finite time and when there are thousands or millions of calculations to be done it may be necessary to reduce the delays.

The main reason for needing to speed up a program are moving graphics that must move smoothly instead of jerkily and to cut down the waiting time in "number crunching" programs that take hours or days performing millions of calculations to solve a mathematical problem.

There are several simple methods of speeding programs by taking advantage of the way the Basic interpreter works. Consider programs (1) and (2) below:

```
(1) 200 FOR 1 = 1 TO 1000
210 COSUB 500
220 NEXT 1
230 STOP
500 RETURN
(2) 200 FOR 1 = 1 TO 1000
210 COSUB 500
220 NEXT 1
230 STOP
300 REM
310 REM
```

Timing these on the Spectrum gave 7.5 seconds for (1) and 8.5 seconds for (2).

The reason the second program takes longer is that when line 210 is

executed the Basic interpreter searches for line 800 by looking through the whole program, starting at the beginning and checking each line number until it finds the line it is looking for. We can see from this that a program will run faster when the most frequently used subroutines are placed near the beginning of the reoveran

If the saving in speed due to having subroutines near the beginning of the program is really significant the program could be laid out as follows:

```
10 GOTO 500
100 REM Most frequently used
sub-routine
```

190 RETURN 200 REM Next subroutine

500 REM Main Program

The interpreter will handle COTO in the same way as COSUB, searching through the line numbers until it finds the one it is looking for, and it is possible to speed up a program by arranging for the destinations of COTO statements to come near the beginning of the program.

REM LINES AND FOR, NEXT LOOPS

Although it is good practice to include plenty of REMarks in a program to explain what it is doing, the program will run faster without the REM lines and if the extra speed is essential these lines can be deleted from the final version. It is also faster to use

FOR ... NEXT loops than IF ... THEN ... GOTO ... Comparing programs three and four:

3) 10 FOR I = 1 TO 1000

20 NEXT I
4) 10 LET I = 1
20 LET I = I + 1
30 IF I <= 1000 THEN
GOTO 20

program three takes 4.4 seconds, while program four takes 8.2 seconds.

A simple counting loop as in program four would normally be written as a FOR. NEXT loop in the first place. However, where a loop would normally be written with IF. THEN. GOTO. there are tricks we can use to replace the loop by FOR. NEXT. For example, suppose we have

110 (start of loop)
190 IF A<>B THEN GOTO 110
we could eliminate the slow GOTO
by writing
100 FOR I = 1 TO 1 STEP 0

110 (start of loop)

190 IF A = B THEN LET I = 2

200 NEXT I

Because we have STEP 0 in line
100 the FOR...NEXT loop would
not normally finish but when A = B
in line 190 the value of I will be
changed to a value greater than the
upper limit of the loop and the loop

will then finish.

Another method of speeding up programs can be seen from the following example:

5) 10 LET A=O 20 LET B=O ... 80 LET H=O 100 FOR I = 1 TO 1000 110 LET A = A 120 NEXT I

6) replace line 110 in (5) by 110 LET A = H



390 REM 500 RETURN

PRACTICAL PROGRAMMING

Program five takes 7.9 seconds, program six takes 8.5 seconds.

The reason for this difference is in the way the variables are stored inside the computer. The Basic interpreter maintains a table of the variable names and the current values of the variables, and whenever it comes across a new variable name it is added at the end of the table. When the interpreter needs to use a variable it starts looking at the beginning of the table and works through until it finds the name it is looking for. Thus, in program (5) the "A" on the right hand side of the assignment was found on the first check, but in (6) the interpreter had to go through "A". "B". "C" until it came to "H".



You may read in some places that using variables instead of numeric constants will make a program faster. This is true in Microsoft Basic, used on the Pet, Apple, Compukt, and many other computers, but it is not true in Sinclair Basic, used on the ZKBI and Spectrum. Consider program (7), obtained by replacing line 110 in (5) by

110 LET A = O

On the Spectrum, program seven takes 7.7 seconds, and is thus faster than five and six however on the Compubit the times for programs five, six and seven are 2.7 seconds, 3.0 seconds and 3.3 seconds respectively (you can see from these comparative timings why 1 am not lappy with the speed of the Spectrum of the second services of the spectrum of the second services of the second second services of the second second services of the second services of the second second services of the second second services of the second se

The common that variables are fassibut not in Sinclair Basic but not in Sinclair Basic but not in Sinclair Basic is the way the program is stored in the computer. In Microsoft Basics a constant is stored as the character codes for stored as the character codes for of character codes is converted to a binary number every time the constant is used; the conversion takes longer than looking up the variable table to find the value of a variable table to find the value of a variable table to find the value of a variable. In Sinclair Basic, however.



although the string of character codes for the digits of a number are stored in the program the corresponding binary number is also stored inside the program, and can be obtained faster than a value from the variable table.

The methods considered above

The methods considered above do not actually reduce the amount of calculation done by a program; these methods give an increase in speed by cutting down the amount of "housekeeping" the interpreter needs to do. Although these

needs to do. Although these methods can give good improvement in speed, really significant improvements can usually be obtained only by actually reducing the amount of calculation to be performed.

To take a practical example, con-

sider a puzzle I saw recently in a magazine. Abstracted from the trimmings about childrens' ages the puzzle boils down to finding the smallest non-trivial integer solutions to the equation

 $+ b^3 = c^3 + d^3$

The obvious method to try first is just to compare the values of the two sides of the equation for all possible values of a, b, c, d, until we find values that satisfy the equation. As the puzzle was about childrens ages we can assume that 16, say, is an upper limit for a, b, c, d, and

write a simple program to test all values up to 16.

values up to 16. 10 FOR A = 1 TO 16

20 FOR B = 1 TO 16 30 FOR C = 1 TO 16

40 FOR D = 1 TO 16

50 IF (A=C) OR (A=D) THEN

60 IF A*A*A + B*B*B = C*C*C +

60 IF A*A*A + B*B*B = C*C*C D*D*D THEN GOTO 110

70 NEXT D

80 NEXT C 90 NEXT B 100 NEXT A

110 PRINT A;" ";B;" ";C;" ";D
On the Spectrum this takes 1 min-

ute 28.8 seconds, and since it is only the answers that are needed and the program would only be used once, we would normally not bother to try making the program faster. However, we can note that

A*A*A, B*B*B, C*C*C are recalculated in line 60, inside the inner loop, although their values do not change every time D changes. If we alter the program by adding:

15 LET M = A*A*A 25 LET N = B*B*B

25 LET N = B*B*B 35 LET P = C*C*C

and changing line 60 to 60 IF M + N = P + D*D*D THEN GOTO 110

the time for the program is reduced to 1 minute 10.8 seconds.

BRIDGE

then panels of bridge experts are usually divided on the best way to

Most bridge magazines run a bid-ing competition with a panel of ting competition with a panel of respects tacking-perhaps 10 bidding situations. The trouble lies in the act that there is only a majority voted but which to base marks, for the ompetition—it is not all all mustable to a panel of 24 international extens to thate their tools over thee of the contract o

ng lead and any opposition bid-and are invited to find the *best* line of play. Sometimes but rarely

BY ALAN HIRON

mes you are just required to find to be best percentage play.

These are the problems that the isting bridge computers are ared to attempt. Not very effied to attempt. Not very effi-iv, as we have seen, but they do

ently, as we have, and cope. Finally we have what is called a framey problem. Strictly ner for you are shi d invited to find the winning play hat succeeds against any d ntly some cards have already been played and you may be reired, say, with seven cards in hand remaining, to make six out of the last seven tricks So how does a computer cope?

lead, there are no trumps and he has to make two of the last three tricks.

SKI 10 \$543 SAOS You got there I hope? South must

lead S9. West has to win and now South makes the last two tricks. Childish by human standards for no other play succeeds unless West does something silly. What about an exhaustive search? It is not too difficult here: as all of the cards are spades, the possible plays to trick 1 are $3 \times 3 \times 3 \times 3$ (=81) in number: there are $2 \times 2 \times 2 \times 2$ (= 16) play to trick 2 and no problem about the third trick. So 1296 possibilities

The human analyst will notice at once that he doesn't have to worry about all these - as far as winning tricks is concerned East's cards are all identical in value and so are North's as far as his hand is concerned

An ingenious programmer might profitably take advantage of this but now you have the old problem - a lot of program to test for this sort of possibility, or is a shorter program that races through all the combinations mucker in the long run? If you think about the logic of

solving the simple problem above. then you must think on these lines: 1) There are 6 × 6 ways for North-South to play their cards.

2) Associated with each of these 36 ways there were 36 ways for East-West to play their cards. Calculate the number of tricks made in every case. If, for any of the North-South possibilities at least two tricks are made whatever East-West trv. then the solution has been found.

3) There may be more than one solution, so the search continues.



In this way all possibilities are explored and a definite answer (or answers!) obtained. Even this can be an irritating affair to program and there are the obvious complications of more cards in each hand, all four suits being involved, and the possibility of a trump suit.

In the next article I will consider how the "exhaustive search" can be reduced to a "tree search". The idea is that once a "branch" has been found to be unsuitable, it isn't explored any further. There will be the certainty of far more subtle programming being required but the length of the calculation may be reduced by several orders of magnitude. Then we will be in business for solving six or seven card (per hand) problems but still not tackling a full deal.

SEARCH FOR A SOLUTION

Finding ways a computer can overcome bridge problems presents many unique difficulties.

The "exhaustive search" technime which helped chess computers "Play and mate in two moves" over 15 years ago, has limited possibilities when it comes to bridge

Consider a full bridge hand - in how many ways can it be played? Much depends on the distribution of the particular hand but if you argue that the nth trick can be started in (14-n) ways and that the other three players (on average) will be able to follow suit with about quarter of their remaining cards then at least we will have an estimate. It looks like $13 \times 3 \times 3 \times 3$ for the first trick, $12 \times 3 \times 3 \times 3$ for the second, 6×2 \times 2 \times 2 for the eight, 1 \times 1 \times 1 \times 1 for the last.

That is roughly $13! \times 3!^3 \times 3!^3 \times$ 313. And that is - but I'll leave you to work it out . . . With present computing power it is obviously hopeless to use this method on full

Suppose that we consider a simple three-card problem "South is on



















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supersonic Starblazer jet fighter on a mission to destory enemy radar bases which are ruining your air force's chance of a successful mission.

The bases are particularly hard to hit as you can only drop your bombs when you are close to the ground, running the risk of crashing into the pylons which flank the radar dishes.

Points can also be scored by bombing the buildings in and around the radar installation -

STARRI A7FR

and attempt to bomb the supersonic tank Picking off these buildings is, however, good bombing practice and I was soon able to work out just the right height and posi-

tion on the screen to hit the radar bases at least three out of five

Once you have hit a radar base your Starblazer zooms up to

the top right hand corner of the screen and mission two flashes ify you to go on to mission two. up the message "destroy supersonic tank" This alas is easier said than done

First you must dodge or shoot a barrage of missiles which fly at

you at great speed moving left to right across the screen. If you survive this onslaught you can then attempt to dive-bomb the supersonic tank which - maddeningly - seems to be always

just out of your bombing range. Missions 3, 4 and 5 were unparticular Starblazer — but for the benefit of any ace pilots who may be reading this you have to omb the ICBM — a mushroom

like structure - attack a more advanced tank which fires back. If you survive all that you get a chance to wipe out the H.Q. I have a particular affection

for this type of game and Starblazer was no exception. It offers fast action and sufficient difficulty to make you keep coming back to improve your performance. I played the game using the keyboard though it can be played with a joystick - which I would imagine would greatly improve

playability. Starblazer runs on Apple II in 48K. It is available from the London based Software House at

 Getting started ● Value Playability

A HAUNTING CHALLENGE

SNAPPER

Shosts may come and go but

Acorpsoft's Snapper will haunt you for some time. This is Pacman as enjoyed in the arcades, with just a few changes which will probably go

unnoticed by many who buy this cassette. The maze has undergone a few changes (programmer's licence) but the tunnel is still there. So is the long and dangerous stretch at the bottom of the screen

The ghosts are as perfect as possible, eyes swivelling in the direction they are heading.

On being eaten their eyes return to the house in the centre of the screen and the blue edible specimens are as arcade players

will remember them. Perhaps the most noticeable change is with the energy dots which when transversed during ghost-chasing, are not consumed.

Keyboard control soon becomes familiar and then the family tussle to put their names on top of the high-score chart. It's all there, music, lights and

action for £9.95 inclusive of VAT for the BBC Model B. Getting started



covering if you'll enjoy the cassette or disk reviewed: Getting Started refers to Inading instructions, loading difficulties and whether or not the game is easy to

understand. Value is the value-formoney side. Does the cassette or disk appear well presented and put together? Does it make good use of the machine's abilities?

Playability is probably the most important mark to look at. Is the game a good example of its type? If it is an original idea, will it succeed in holding your attention

The main bulk of the review is the place where our names testers can give their own opinions on the offering but the marks seek to provide an accurate buying quide.

TO CONOUER EARTH You won't need to be a king of

the arcades to repel this squadron of Vic Invaders. The game is written in

machine code and apparently has five skill levels - though I could discern no great difference hetween skill level one and five. The game gives you no mystery flying saucers to shoot at -

thus ignoring the most enjoyable aspect of the arcade version of Space Invaders.

It is also very easy to stay alive. All you have to do is keep the space bar depressed and a constant stream of missiles will cancel out the missiles of the advancing fleet. I almost managed to wipe out an entire fleet by keeping the space bar depressed without moving right or

Another disappointing feature of this game is that you cannot Getting started fire and move your gun turret at . Value the same time. This makes it

VIC INVADERS impossible to zoom in and hit that

last invader on the run with style. The game could also have been greatly improved if the high score display kept a running total of high scores, rather than giving every last score as the current high score, whether it was higher or not.

The producers must have realised it was rather easy and give just one life instead of the usual

The missiles in this game also left a little to be desired - jerking skywards and pausing midscreen for breath. Vic Invaders is available from

Stockport based Bridge Software. It costs £6.90 and runs on the unexpanded VIC-20.

Playability

Value

Playability

A NICE LITTLE MOVER

ter about the way this chess program went about assuring itself of a good review.

My first encounter with it came on level two where it hoasted a 35 second response time to the average move. (Careful timing out it a little above this but perhaps my moves were just ahove average).

It started brightly despite not having a book opening repertoire to fall back on. Snapping up my queen's bishop's pawn gambit, it held onto the extra piece tenaciously enough during the opening and also developed its pieces well. Doing, just enough, in fact, to make me think I had found a worthy opponent and then, when study if you are going to take the it sensed I was ripe for the tak- game seriously. The computer ing, it capitulated to a particular- display does take a little getting ly sweet queen and bishop used to as does algebraic notaattack and allowed itself to become mated soon afterwards so tions are a help here. that I didn't get bored by the

ZX CHESS

The result: one reviewer feeling particularly pleased with himself and more than willing to write nice things about the opponent which had just given in so graciously.

Further testing on its other levels still suggested that the 35 second response game is the best to play unless you have something to do whilst awaiting in next move in the higher levels.

seconds) I felt I was getting my own way rather too easily. The screen disappears while the computer is thinking, so you will need your own board to

tion but the extensive instruc-The computer will not allow

illegal moves, it will let you play

black it understands castling and en nassant I miss not being able to play

through my favourite openings with impunity but what can you expect for £6.95?

Sinclair ZX81 Chess is pro duced for the 16K machine by

Getting started **●**Value Playability



DEADLY DEATH SHIPS

OMEGA RACE

computer software - a truly compulsive game.

The year is 2003. Aliens are attacking the city of Komar. You must defend the city in your arrow shaped space craft.

The game is played using VIC paddles which can be purchased from most VIC dealers at around the £14 mark.

The ship is quite difficult to control and at first appears to float around the screen at will. Only after several goes did I discover that the ship will zoom forward in the direction of the persistance. arrow if the fire button is kept

The paddle dial turns the ship spin and fire as you move forgo steady - as once you have chosen a certain course you will have to fire quickly to clear all the aliens out of your way.

track you around the rectangle in your advantage - bouncing off it

Omega Race is that rare thing in the centre of the screen which displays your score, the current high score and the number of ships you have left.

Most deadly are the Death Shins which spin around the screen at great speed and can shoot and manneuvre Command ships can also

shoot and track you around the rectangle for the most part of the game multiplying in number as the game progresses. Droid ships are slower and easier to kill than Command ships though they will track you with dooged

Just to make things a little more difficult there are also two types of mines - Photon mines full circle - the secret being to and vapour mines dotted around the screen, which are easy to ward - just as in Asteroids. But crash into as you race around the screen chasing a Death Ship.

The game features an invisible force field at the right and left of the screen which, if you are a Five different types of alien skilled player, you can use to

at full speed and then swivelling to shoot - or to take the corners Omega Race is practically

identical to the arcade game of the same name. Playing the as good as playing the game in an arcade.

This is a relatively simple game with not particularly inspiring graphics - they are very geometrically similar to Aster-

oids graphics. But for sheer play ability Omega Race is by far the best game I have played on the VIC-20. Nothing else comes

Omega Race is the latest addigame on your VIC-20 is every bit tion to Commodore's range of solid state plug in games. Avail-

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HARDCORE

A GAMES PLAYER'S GUIDE TO THE TEXAS T.I. 99/42

TEXAS — AN AMERICAN FAVOURITE

The Texas Instruments 99:4a is a recently re-vamped version of the 99:4 which, in 1978 represented the giant American electronics firm a first venture into the microcomputer field. Since then the T.I. 99:4a has established itself as one of America's more popular home com-

puters.

The basic package is a 16-bit (com pared to the more common 8-bit) microprocessor which gives you 16K of RAN

memory expandible up to 48K.

The T.I. is a colour computer with 16 foreground and background colours although the machine will function adequately on a normal black and white television.

The keyboard has electric typewriter style keys — 48 of them — with control

and function keys (user definable), fu

lock, and auto repeat keys.

The computer also has impressiv sound capabilities — five octaves, thre simultaneous tones, plus noise general controls.

It is fairly compact measuring 15×10 inches, and 23 inches high. It weighs about 51bs and runs off 240 volts in the

The machine is now in the shops a around the £200 mark, the price having fropped by £100 in the last 12 months. I beems a fair assumption as well that the price will continue to fall with rumours o a drop in price of the ¥10-20, the appear and the state of the \$100 months of the beautiful the state of the \$100 months of the price of the \$100 months of the beautiful the \$100 months of the price of the \$100 months of price price of price price of price price price price price

T.I. EXPANSION

The T.I. has a variety of peripherals available to enable you to expand the system as you require — either for home use, or for commercial applications.

The most simple expansion to your T.I. is to purchase some leads and plug in your cassette recorder — this enables you to store your own programs, or to purchase other pre-recorded cassettes that are

The Peripheral Expansion System is a show-how shaped until in brushed aluminium with eight slots for peripheral board-type cards, one of which connects the system to the computer console. You simply plug in the required function card, for example Extended Basic, Mailing List, or one of the other cartridges. The system will also enable you to use one disc drive within the enclosure. This costs £190.

The T.I. Disk Memory System enables you to save or load Basic programs for later use. It incorporates a disc controller and up to three disc drive units. The discs are single sided, single density, 5½ min-floppy diskettes each storing up to 90,000 bytes of information. The T.I. DMS costs £240.

A 400 word vocabulary is built into the L1. Solid State Speech Synthesizer. The words are individually stored on chips and are reproduced electronically through a loudspeaker. The synthesizer is useful for recibing instructions, enhancing games and educational programs. As might be expected from a machine from Texas it speaks with a pronounced U.S. accent. The Speech Synthesizer is swallable at 159.00.

T.I. also manufacture an Interface Card
which enables you to connect a wide
range of computer accessories to your



Magnus Pike tries out the T.I. 99/4a during a recent Texas press conference

basic console — some of which are manufactured by Texas, but the Interface Card enables you to use accessories from other manufacturers as well. The Interface Card is a communications link which enables you to exchange and receive data over the telephone line with other computers. It is available at £130.

The T.I. printer plugs in directly to the computer console and does not require an Interface Card. It prints data in a 32 column, 5 × 7 dot matrix characters at a speed of 30 characters per second. The machine has 32 graphic symbols (predefined) and can be used to plot — printing on thermally sensitive page.

T.I. manufacture a set of Wired Remote Controllers — joysticks, which plug into the

HARDCORE

A GAMES PLAYER'S GUIDE TO THE TEXAS T.I. 99/4a

back of the computer console. They are made of hard black plastic with the fire button mounted above the lever Available from T.I. dealers at £24.00.

All prices are recommended by T1 but you would be well advised to shop around as prices vary from one retailer to

SPRITFI V RASIC

The TI 99/4a runs under T.I. Basic when no solid state cartridges are plugged into the software port. The main difference from Microsoft is that T.I. Basic does not have the PEEK and POKE functions, familiar to most other microcomputer users

An Extended Basic is produced by T.I. which plugs into the software port on the front of the console. Extended Basic has all the features of Basic with an additional 40 commands and sub programs. Extended Basic also has "Sprites" or programmable

T.I. Logo is an educational language designed mainly with young children in mind. It uses an easy to understand set of commands and instructions within computer illustrated exercise. It requires the expansion system, disc drives, and will be aimed mainly at the primary school market.

UCSD-Pascal is an advanced language for the more experienced programmer. You will need the 32K Byte RAM-expansion and the T.I. Disc Memory System.

The software package contains the Pascal compiler to translate Pascal programs into P-code, an editor, filer and utilities package for screen editing and file management and an Assembler linker package for developing TMS 9900 Assembly Language programs. The P-code compiler enables you to run

programs which have been written for other computers on your T.I.

TMS 9900 Editor/Assembler extends the computer by giving the user direct access to all system features, such as sneech, sound and the graphics and interfaces. This language allows the fastest pussible sneed to be obtained from the micro computer's 16-bit microprocessor.

CLUB TOGETHER

TIHome is the TI 99/4a users' club. It was set up a year ago by keen hobbyist Paul Dicks and is run independently of Tl. The annual membership fee is £9.95 for which members receive a news letter every two months, have access to a software library. and can benefit from TIHome's connections with the American 99/4 Users

The club now has over 500 members. If rou would like to join the club write to Paul Dicks at 157 Bishonsford Road, Morden, Surrey, SM4 6BH.

OUALITY GAMES

The availability, range and quality of software has been one of the chief criticisms levelled at the T.I. 99/4a since its launch in

Since then T1 have been working hard

to improve this state of affairs. In particular they will be publishing a software review with names and addresses of all the independent enflware writers known to T.I. This is to be available in September 1982. Other plans for improving the availability

of software include a scheme whereby individual companies purchase patented T1 cartridges and then write their own programs on them, which they can sell independently of T.I.

Texas is tight-lipped about which companies have taken up the offer so far. although it is known that Thorn EMI's computer wing has accepted the offer and will be producing software - mainly games — for the T.I. 99/4a.

T.I. manufactures some six hundred software nackages itself. There are a number of business cassettes, some interesting educational packages, and a wide range of games including some of the old favourites such as Space Invaders and Pacman. The quality of the graphics on some of these games is of the traditional high standard associated with solid state ROM cartridges. It has to be said however, that these are not cheap, Space Invaders, for example, costs £40.

Milton Bradley a U.S.-based toy manufacturer produces a range of five games for the T.I. 99/4a which are imported to the U.K. by T.I. and are available from dealers.

In total there are over 1,000 packages available in the U.S. 'or the T.I. - on cassette disc or cartridge-manufactured by a number of companies. T.I. are negotiating with a number of U.K. importers to bring these packages into the country

NOW READ ON . . .

An instruction manual is supplied with the T199/4a and is written for the beginner. You will also receive a Users Reference Guide and a Read This First pamphlet which shows you how to set up your home computer

For the more advanced user. Texas publish Programming Basic with the TI Home Computer. This 300 page book takes you heyond Beginners' Basic. It costs £7.

There is also a bi-monthly American manazine called the 99'er which is written specifically for owners of T.I. home computers. It is now available in the UK from your local T.I. dealer at £2.35 or by subscription at £13.00 for six issues direct from M.P.I., 8 Cambridge House, Cambridge Road, Barking, Essex, IG11 8NT,

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MIND ROUTINES



Consider the octohedron above with the 8 faces marked a through to H. There are 6 nodes N₁-N₆ and four faces meet at each node.

By using the numbers 1-8 place each number on a face. There are four questions this month. 1. Calculate the node values as the sum

 Calculate the node values as the sum of the four adjacent sides. What is the maximum product of all 6 nodes which can be obtained?

Using the node values as in 1 what is
the minimum product of all 6 nodes

 which are he achieved?

which can be achieved?

3. Calculate the node values as the product of the four adjacent sides. What is the maximum sum of all 6 nodes

which can be achieved?
4. Using the node values as in 3 what is the minimum sum of all 6 nodes which can be achieved?

which can be achieved? You should submit your values for A-H for each of the 4 answers. Example Suppose we numbered the

sides A=1, B=2, etc H=8Then the node sum $N_1=1+2+3+4=10$. And the node product will be $N_1=1\times2\times3\times4=24$

For all 6 nodes we have Node Node Sum Product

1 10 24
2 14 60
3 18 252
4 22 672
5 18 160
6 26 1680

Product of sums = 25945920 2848=Sum of products
These values lay somewhere between the maximum and minimum results.

NEVERA CROSSWORD

ACROSS

Pacman ghosts in edible mode (4,8).

 Sure me confused. Restart

the program (6).

9. Articles on wood provide

one kind of computer (6).

12. Times are mixed up (3).

13. Man, high class king, first

class warrior (8). 15./18. across. "T" sights reassembled to join two

points on a screen (8,5).

16. G Merlin I thinks it's a kind of Bug (7).

17. Upper class regret concerning sur-

roundings (3).

18. Re-align, losing force becomes confused but ends up straight (6).

Stab or end this mixed-up process (6).
 Match Ali mate adds up (12).

DOWN

 Lean on a public relations "own goal" to make hard copy of computer game (4.1.4).

(4,1,4).
3. Take legal action against Barker (3).
4. Continuous read out pound handle of

games interface (7.4).

5. Right machine language initially pro-

 Right machine language initially provides educational computer (3).
 Chieftains converge on former C&VG

computer battle ground (10).

8. Young lady states her intention to become crude about bomb H.Q. (7,4).

Good player sees G-Man in disorder (5, 5).
 One Politician on rising ground in

Adventure game (3,4).

14. Bulls eye sanctuary (5,4).

19. Programme: IF this was to be added

19. Programme: IF this was to be added to the 9'O Clock News . . . (3).
20. Computer Company in scenes one and two (3).

A beginner's guide to plain jargor

ALGORITHM: A process or set of rules to carry out a task or solve a mathematical ARRAY: A series of items arranged to form

BASIC: The most widespread computer language which is one of the easiest to learn and is used for programming all

BIT: An abbreviation for a binary digit. It

BUG: A slang term given to a mistake in a working. It can refer to a mechanical.

electrical, or electronic fault. BUS: The circuit over which data or power

BYPASS PROCEDURE: Method of getting vital information into a computer if the line

control computer fails. BYTE: A term to measure a number of Bits (Binary digiTS), usually there are eight bits

CALCULUS: Alegbraic notation. COLOR: American spelling used to call

CURSOR: A position indicator used by most

computers to show where the next charac-GFT: A Rasic command which tells the

GRAPHICS MODE: A mode in which the computer can produce graphical charac-

HARDWARE: The general term given to all pieces of electronic and mechanical devices which make up a computer system, i.e. the actual machines. INKEYS: A Basic command which checks

the keyboard for input and places it in a INPUT: Data or information which is fed

INTEGER: A number which does not contain a decimal point, i.e. a whole number. INTERFACE CARD: Communications system which enables computer users to transmit data using a variety of communications devices. There are international standards for interfaces RS-232 being perhaps the best known.

K: See kilobyte. KILOBYTE: A measurement of memory capacity. 1K is equal to 1024 so 8K is

LE.D.: (Light Emitting Diode) Provides a simple display and consists of an electron tube which lights up when electricity is

LOAD: Instruction which is used in con-

junction with a cassette recorder to transfer programs from tape to the computer's

MATRIX: Is an array of numbers in columns and rows - most microcomputers use a dot matrix printing system. MENU: List of programs, questions, or

procedures which are displayed on the screen for selection by the user PERIPHERALS: Equipment which is used with a computer system, e.g. printers, disc

PLOT: To map or draw points on the RAM: (RANDOM ACCESS MEMORY) This

is a memory chip which you can load programs and data to and from. RAMPACK: A cigarette-case sized pack of

extra RAM which plugs onto the back of a Sinclair ZX81. RUN: Basic command word tells the com-

outer to perform the numbered sequence SOFTWARE: Another name for computer

SOLID STATE: Refers to components made up of solid materials as opposed to the now defunct vacuum and gas tubes that you used to see in old television sets. Microcomputers have solid state circuitry.

STAR TREK: A popular computer game based on the TV series of the same name in which the player takes command of the Starship Enterprise and roams the galaxy

STATEMENT: An instruction in a computer STRATEGY GAME: A game in which you

must carefully plan your moves taking into consideration the likely counter moves of STRING: Usually represented by \$ sign on

the computer keyboard, a string is a connected sequence of characters or words usually placed within PRINT statements.



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POWER AND THE MICRO

Single rail power supplies, i.e. those with only one voltage output which is usually all that is needed for most of the most common machines, are quite easy to build, so long as you go about it in a sensible manner. I will give you a few ideas to work on and some useful precautions to take. It is of the utmost importance that the output is fully protected and fail-safe as a power surge on the board is fatal to the chips.

Power supplies have become far simpler by the introduction of voltage regulator I.C.s. These chips come in different voltages and current ratings, depending on your requirements. Most are fully protected from over voltage, short current and over heating. Basically all they need as an input is a DC voltage a couple of volts above that of the output.

There are, however, a few external components which are recommended for safe use. These are usually bypass capacitors and are generally available in your local components' shop, along with the rest of the bits and pieces.

Below, I have outlined a simple power supply with a transformer, a bridge rectifier comprising 4 diodes, a smoothing capacitor and the regulator unit, including capacitors. This arrangement would be quite adequate in its present form to cope with most applications. It would, however, be advisable to add a few extra safety components.

Going from left to right we first come across the transformer. Most these days have two separate primary windings so that they can be used with both 120 or 240 volt mains supplies. They must, of course, be

THE PERSON NAMED IN COLUMN TWO

computers to turn them linto a sociarather than just a thinker. When I came to think of it though, a prot That is, the power consumption of the first batch of ZX81s would only run the computer and nothing else to cope with all the subsequent parts. It would of course, been easier and cheaper to construct

wired for 240 volts in this country. The first extra component is a mains voltage dependent resistor or transient suppressor. These items are wired between the live and neutral of the mains. They act normally as an open circuit, until a higher than usual voltage is applied when they go short circuit. Make sure that your mains fuse is light enough to protect the mains cable from over heating. if the high voltage is maintained.

Also, make sure that the transformer, and all other components for that matter are able to supply or carry the current which you require. If you are aiming to achieve 5 volts at the output a 6-0-6 transformer will be sufficient if the secondary coils are connected in parallel.

From the diagram that would mean connecting pins 1 to 3 and 2 to 4 and taking the pairs to opposite sides of the bridge rectifier. Once smoothed the 6 volts a.c. will become approximately 8 volts, this being sufficient to feed to the regulator

Depending on the current capacity of the regulator you are advised to get a transformer which will supply twice that required at the output. This will ensure that the transformer does not misbehave itself by giving out little spikes

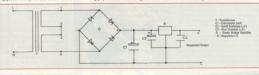
Transient suppressors could also be used before the diode bridge. although this is not absolutely necessary. Diode bridges can be obtained for different current ratings and you should aim to fit one which can cope with more than you require. This will keep the operating temperature well down.

To smooth the AC you will require a large electrolytic capacitor in the millifarad (thousands of microfarads) range depending on the current drain. Each capacitor is graded in capacity, voltage and ripple current. It is advisable to over estimate the last two by, say, a marter

Remember that the voltage specified will be the output from the bridge and not the regulator, so for a 5 volt regulator with 8 volt input a 10 volt electrolytic would be sufficient, although 16 volts will be bet-

There should be with the regulator a specification sheet indicating the type and value of the required capacitors. Usually, though, a solid tantalum is used on the input with a disc ceramic on the output to suppress little spikes from the regulator. Without going overboard with protection this is all that you will need for a perfectly workable power supply. I would recommend that the unit is built up on one of the stripboards, taking care not to heat

up the tracks too much This technique of building power supplies can be used to produce multiple rail versions for some of the more advanced machines if required. Enough has been written on power supply for you to go away and design your own power station, so be adventurous and save yourself some pennies.



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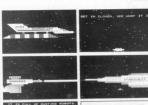
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